

FCC PART 15.249

TEST REPORT

For

**Serene Innovations, Inc.**

14731 Carmenita Road, Norwalk, CA, USA

**FCC ID: Z33-CA4**

<b>Report Type:</b> Original Report	<b>Product Type:</b> RF module
<b>Test Engineer:</b> Allan An	<i>Allan An</i>
<b>Report Number:</b> RSZ110921006-00	
<b>Report Date:</b> 2011-12-09	
<b>Reviewed By:</b> Alvin Huang EMC Engineer	<i>Alvin Huang</i>
<b>Test Laboratory:</b> Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008 <a href="http://www.baclcorp.com.cn">www.baclcorp.com.cn</a>	

**Note:** This test report is prepared for the customer shown above and for the equipment described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report must not be used by the customer to claim product certification, approval, or endorsement by NVLAP\*, or any agency of the Federal Government.

\* This report contains data that are not covered by the NVLAP accreditation and are marked with an asterisk "★" (Rev.2)

## TABLE OF CONTENTS

<b>GENERAL INFORMATION.....</b>	<b>3</b>
PRODUCT DESCRIPTION FOR EQUIPMENT UNDER TEST (EUT) .....	3
OBJECTIVE .....	3
RELATED SUBMITTAL(S)/GRANT(S).....	3
TEST METHODOLOGY .....	3
TEST FACILITY .....	3
<b>SYSTEM TEST CONFIGURATION.....</b>	<b>5</b>
JUSTIFICATION .....	5
EQUIPMENT MODIFICATIONS .....	5
SPECIAL ACCESSORIES .....	5
CONFIGURATION OF TEST SETUP .....	5
BLOCK DIAGRAM OF TEST SETUP .....	5
<b>SUMMARY OF TEST RESULTS .....</b>	<b>6</b>
<b>FCC§15.203 - ANTENNA REQUIREMENT.....</b>	<b>7</b>
APPLICABLE STANDARD .....	7
ANTENNA CONNECTOR CONSTRUCTION .....	7
<b>FCC§15.205(A) §15.209(A) §15.249(A) §15.249(C) §15.249(D) §15.35 - RADIATED EMISSIONS .....</b>	<b>8</b>
APPLICABLE STANDARD .....	8
MEASUREMENT UNCERTAINTY .....	8
TEST EQUIPMENT SETUP .....	8
EUT SETUP .....	9
TEST PROCEDURE .....	9
CORRECTED AMPLITUDE & MARGIN CALCULATION .....	10
TEST EQUIPMENT LIST AND DETAILS.....	10
TEST RESULTS SUMMARY .....	10
TEST DATA .....	10

---

## GENERAL INFORMATION

---

### Product Description for Equipment under Test (EUT)

The *Serene Innovations Inc.*'s product, model number: *CA4 (FCC ID: Z33-CA4)*, or the "EUT" in this report was a *RF module*, which was measured approximately: 2.5 cm (L) x 1.6 cm (W) x 0.8 cm (H), rated input voltage: DC 3V.

#### Technical information

Frequency band: 2422 MHz  
Modulation Type: GFSK

*\* All measurement and test data in this report was gathered from production sample serial number: 1109060 (Assigned by BACL, Shenzhen). The EUT was received on 2011-09-21.*

### Objective

This report is prepared on behalf of *Serene Innovations Inc.* in accordance with Part 2, Subpart J, and Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.249 rules.

### Related Submittal(s)/Grant(s)

No related submittal.

### Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2009, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

### Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located on the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on December 06, 2010. The facility also complies with the radiated and AC line conducted test site criteria set forth in ANSI C63.4-2009.

The Federal Communications Commission has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is an ISO/IEC 17025 accredited laboratory, and is accredited by National Voluntary Laboratory Accredited Program (Lab Code 200707-0).



The current scope of accreditations can be found at <http://ts.nist.gov/Standards/scopes/2007070.htm>

## SYSTEM TEST CONFIGURATION

### Justification

The system was configured for testing in a testing mode.

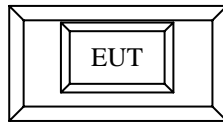
### Equipment Modifications

No modifications were made to the unit tested.

### Special Accessories

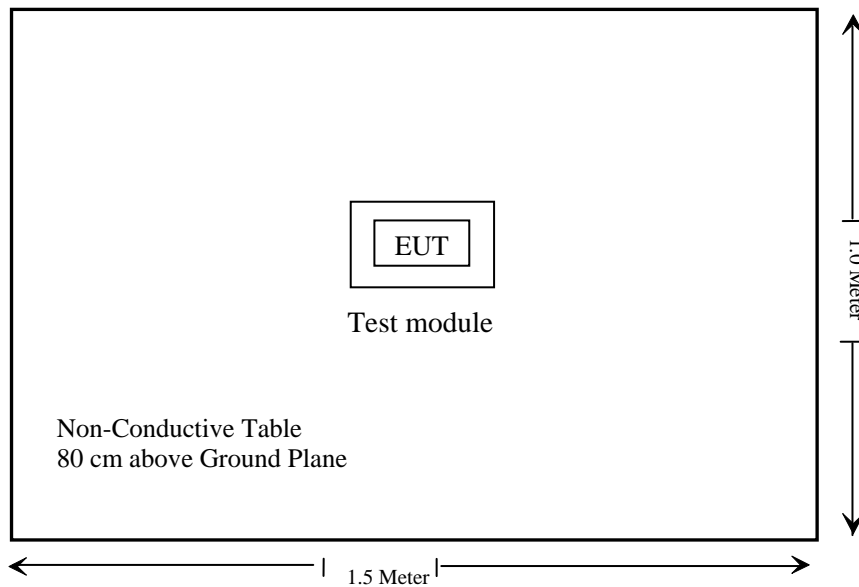
Provided by manufacturer

### Configuration of Test Setup



Test module

### Block Diagram of Test Setup



**SUMMARY OF TEST RESULTS**

<b>FCC Rules</b>	<b>Description of Test</b>	<b>Result</b>
§15.203	Antenna Requirement	Compliance
§15.207(a)	Conduction Emissions	N/A*
§15.209(a) §15.249(a) §15.249(c) §15.249(d)§15.35	Radiated Emissions	Compliance

Note: N/A\* The EUT was powered by battery only.

---

## **FCC§15.203 - ANTENNA REQUIREMENT**

---

### **Applicable Standard**

For intentional device, according to §15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used.

### **Antenna Connector Construction**

The antenna was build on board and was complied to section 15.203.

**Result:** Compliant.

Please refer to the EUT photos.

## **FCC§15.205(a) §15.209(a) §15.249(a) §15.249(c) §15.249(d) §15.35 - RADIATED EMISSIONS**

### **Applicable Standard**

As per FCC§15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

<b>Fundamental frequency</b>	<b>Field strength of fundamental (millivolts/meter)</b>	<b>Field strength of harmonics (microvolts/meter)</b>
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per FCC§15.249 (c), Field strength limits are specified at a distance of 3 meters.

(d) Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

### **Measurement Uncertainty**

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at Bay Area Compliance Laboratories Corp. (Shenzhen) is 4.0 dB.

### **Test Equipment Setup**

The spectrum analyzer or receiver is set as:

Below 1000 MHz:

$$\text{RBW} = 100 \text{ kHz} / \text{VBW} = 300 \text{ kHz} / \text{Sweep} = \text{Auto}$$

Above 1000 MHz:

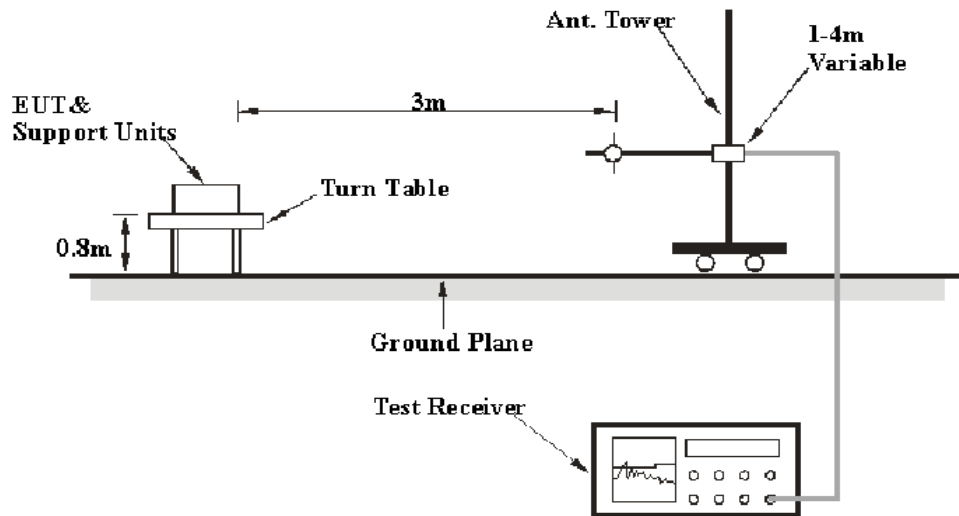
$$\text{Peak: RBW} = 1\text{MHz} / \text{VBW} = 1\text{MHz} / \text{Sweep} = \text{Auto}$$

$$\text{Average: RBW} = 1\text{MHz} / \text{VBW} = 10\text{Hz} / \text{Sweep} = \text{Auto}$$

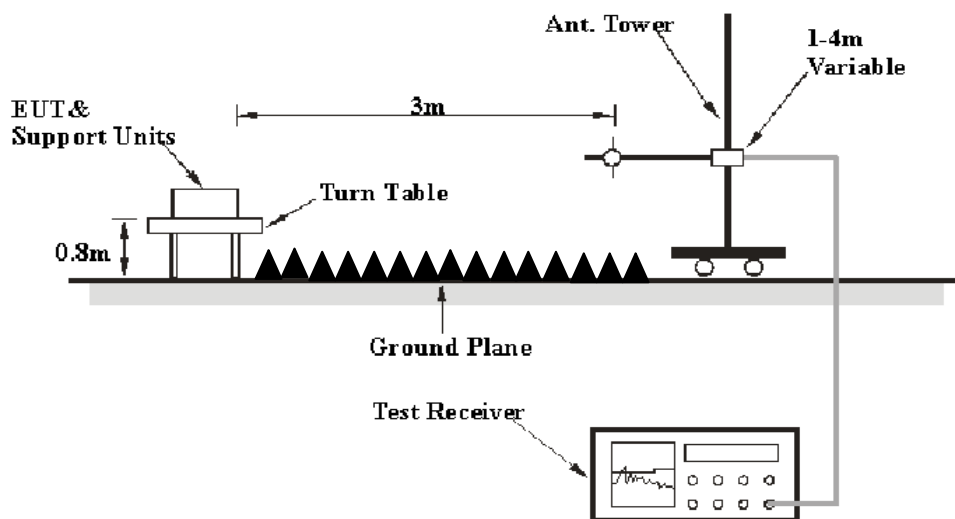


## EUT Setup

### Below 1 GHz:



### Above 1 GHz:



The radiated emission and out of band emission tests were performed in the 3 meters, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15.209 and FCC 15.249 limits.

## Test Procedure

For the radiated emissions test

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 mete, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

## Corrected Amplitude & Margin Calculation

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

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

The “**Margin**” column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of 7dB means the emission is 7dB below the limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	8447E	1937A01046	2011-08-02	2012-08-01
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2011-11-11	2012-11-10
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2011-07-05	2012-07-05
Mini-circuits	Amplifier	ZVA-213+	T-E27H	2011-03-08	2012-03-07
Sunol Sciences	Horn Antenna	DRH-118	A052604	2011-05-05	2012-05-04
The Electro-Mechanics Co.	Horn Antenna	3116	9510-2270	2011-05-05	2012-05-04
Rohde & Schwarz	Signal Analyzer	FSIQ 26	609358	2011-07-08	2012-07-07

\* **Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

## Test Results Summary

According to the data in the following table, the EUT complied with the FCC Part 15.209 /15.205/15.249, with the worst margin reading of:

**4.90 dB at 4844 MHz in the Horizontal polarization**

## Test Data

### Environmental Conditions

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56%
<b>ATM Pressure:</b>	100.0 kPa

*The testing was performed by Allan An on 2011-12-09.*

*Test Mode: Transmitting*

**30MHz~25GHz Radiated Emission:**

Indicated		Detector (PK/Ave.)	Table Angle Degree	Antenna		Correction Factor			FCC 15.249/15.205/15.209			
Frequency (MHz)	Receiver Reading (dB $\mu$ V)			Height (m)	Polar (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	Margin (dB)	Comment
2422	85.21	PK	175	1.6	V	30.3	3.03	27.54	91.00	114	23.00	Fund.
2422	83.65	PK	0	1.5	H	30.9	3.03	27.54	90.04	114	23.96	Fund.
2422	78.13	Ave.	175	1.6	V	30.3	3.03	27.54	83.92	94	10.08	Fund.
2422	77.78	Ave.	0	1.5	H	30.9	3.03	27.54	84.17	94	9.83	Fund.
4844	36.01	Ave.	178	1.5	H	36.3	4.3	27.51	49.10	54	4.90	harmonic
4844	37.12	Ave.	154	1.5	V	35	4.3	27.51	48.91	54	5.09	harmonic
4844	46.46	PK	178	1.5	H	36.3	4.3	27.51	59.55	74	14.45	harmonic
4844	47.29	PK	154	1.5	V	35	4.3	27.51	59.08	74	14.92	harmonic
2495.5	19.48	Ave.	185	2.3	H	31	3.05	27.54	25.99	54	28.01	Spurious
2399.9	19.58	Ave.	360	2.2	H	30.9	3.03	27.54	25.97	54	28.03	Spurious
2485.4	19.65	Ave.	15	2	V	30.5	3.05	27.54	25.66	54	28.34	Spurious
2395.8	19.86	Ave.	145	1.8	V	30.3	3.03	27.54	25.65	54	28.35	Spurious
2395.8	38.95	PK	145	1.8	V	30.3	3.03	27.54	44.74	74	29.26	Spurious
2485.4	38.01	PK	15	2	V	30.5	3.05	27.54	44.02	74	29.98	Spurious
2399.9	36.54	PK	360	2.2	H	30.9	3.03	27.54	42.93	74	31.07	Spurious
2495.5	33.55	PK	185	2.3	H	31.0	3.05	27.54	40.06	74	33.94	Spurious

Note: The other data which below the limit 20 dB was not recorded.

**\*\*\*\*\* END OF REPORT \*\*\*\*\***