

## **TEST REPORT**

Report Number: 101310621MPK-008 Project Number: G101310621 November 24, 2013

Testing performed on the RFID Finger Sensor Assembly Model Number: COC2013 FCC ID: 2ABD4COC

FCC Part 15 Subpart C (15.209) FCC Part 15 Subpart C (15.207) FCC Part 15, Subpart B

Class: B

for

NovaSom, Inc.

Test Performed by:
Intertek
1365 Adams Court
Menlo Park, CA 94025 USA

Test Authorized by:
NovaSom, Inc.
801 Cromwell Park Drive
Glen Burnie, MD 21061 USA

Prepared by: Jainu Jogani Date: November 24, 2013

Reviewed by: Date: November 24, 2013

Krishna K Vemuri

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EMC Report for NovaSom, Inc. on COC2013

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# **VERIFICATION OF COMPLIANCE Report No. 101310621MPK-008**

Verification is hereby issued to the named APPLICANT and is VALID ONLY for the equipment identified hereon for use under the rules and regulations listed below.

Equipment Under Test: Trade Name: Model No.: Serial No.:	NovaSom, Inc. COC2013 AccuSom with RFID Finger Sensor Assembly and other sensors M/N: NS2010 SI: 020712402 RFID Finger Sensor Assembly M/N: COC2013 SI: MPK1309061148-012
Applicant: Contact: Address:	NovaSom, Inc. Laurie Yates NovaSom, Inc. 801 Cromwell Park Drive
Country	Glen Burnie, MD 21061 USA
Tel. number: email:	415-613-8421 lyates@NovaSom.com
Applicable Regulation:	FCC Part 15 Subpart C (15.209) FCC Part 15 Subpart C (15.207) FCC Part 15, Subpart B
Equipment Class:	Class B
Date of Test:	September 27 – November 08, 2013
We attest to the accuracy of this report:	
Ogani	(Kishove
Jainu Jogani	Krishna K Vemuri
Project Engineer	EMC Senior Staff Engineer

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## **EXECUTIVE SUMMARY**

Test	Reference FCC	Result
Transmitter Radiated Emissions	15.209	Complies
AC Line Conducted Emission	15.207	Complies
(Transmitting mode)		
Radiated Emission from Digital	15.109	Complies
Part and Receiver		
AC Line Conducted Emission	15.107	Complies
(Charging mode)		
Antenna Requirement	15.203	Complies. The EUT does not have an
_		external antenna connector

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### 1.0 Job Description

#### 1.1 Client Information

The EUT has been tested at the request of:

Company: NovaSom, Inc.

801 Cromwell Park Drive Glen Burnie, MD 21061 USA

Name of contact: Laurie Yates Telephone: 415-613-8421

Email: lyates@NovaSom.com

#### 1.2 Test Plan Reference

Tests were performed to the following standards:

- FCC Part 15 Subpart C (15.209)
- FCC Part 15 Subpart C (15.207)
- FCC Part 15, Subpart B

#### 1.3 Equipment Under Test (EUT)

Equipment Under Test				
Description	Model Number	Serial Number		
RFID Finger Sensor Assembly	COC2013	MPK1309061148-012		

**EUT receive date:** September 06, 2013

**EUT receive condition:** The EUT was received in good condition with no apparent damage.

**Test start date:** September 27, 2013 **Test completion date:** November 08, 2013

The test results in this report pertain only to the item tested.

NovaSom, Inc. supplied the following description of the EUT:

The model: NS2010 consists of an AccuSom with RFID Finger Sensor Assembly. It has three sensors: the breath sensor, the chest sensor and the finger sensor. The RFID bracelet is placed on the patient's wrist prior to being supplied the AccuSom device. The patient assembles unit prior to going to bed, puts on the three sensors and pushes the On/Off button and release. The black RFID Reader located on the finger sensor must be positioned directly over the RFID tag disk in the RFID bracelet at all times. If the RFID bracelet is not under the RFID Finger sensor the LED indicators will flash yellow and the device recording is interrupted.

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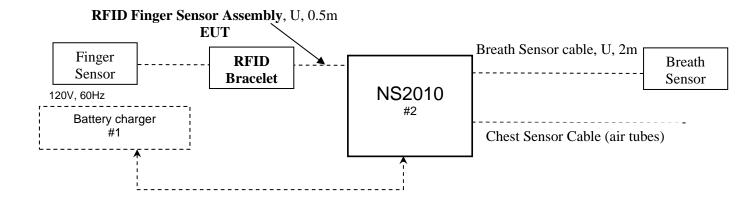
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## 1.4 System Support Equipment

Item #	Description	Model No.	Serial No.
1	Battery Charger (Medical Power Supply)	MW172KB0503B01	MPK1309061148-014
2	AccuSom with RFID Finger sensor	NS2010	020712402
	Assembly and other sensors		

## 1.5 System Block Diagram



S = Shielded	
U = Unshielded	$\mathbf{m} = \text{Length in Meters}$

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#### 1.6 Justification

The EUT was configured for testing in a table-top configuration, as specified by NovaSom, Inc.

Highest Clock or Oscillator Frequency used is 100 MHz; therefore according to FCC Rule, radiated emissions should be verified up to 1 GHz.

## 1.7 Mode(s) of Operation

The equipment was tested in normal operating mode. In this mode, the chest sensor, the finger sensor and the breath sensor are activated and continuously monitored. No connection to the AC mains is made in this mode. Also, RFID was activated during the test.

### 1.8 Modifications Required for Compliance

No modifications were made during compliance testing in order to bring the product into compliance.

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## 2.0 Test Environment for Emissions Testing

## 2.1 Test Facility

The test facility is located at 1365 Adams Court, Menlo Park, California. The test site is a 10-meter semi-anechoic chamber. The site meets the characteristics of CISPR 16-1 and ANSI C63.4. For measurements, a remotely controlled flush-mount metal-top turntable is used to rotate the EUT a full 360 degrees. A remote controlled non-conductive antenna mast is used to scan the antenna height from one to four meters.

The A2LA certificate number for this site is 1755-01. The Industry Canada (IC) Site Number is 2042L-1.

### 2.2 Test Equipment

**Table 2-1** contains a list of the test equipment used during the testing.

Table 2-1 List of Test Equipment

Equipment	Equipment Manufacturer		Model/Type Serial #		Cal Due
RF Filter Section	Hewlett Packard	85460A	3448A00267	12	03/12/14
EMI Receiver	Hewlett Packard	8546A	3710A00373	12	03/12/14
Passive Loop Antenna EMCO		6512	1029	12	07/12/14
BI-Log Antenna TESEQ		CBL6111D	31222	12	04/05/14
Pre-Amplifier	Sonoma Instrument	310	185634	12	12/12/13
LISN	FCC	FCC-LISN-50-50-M-H	2011	12	02/28/14

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### 2.3 Example Field Strength Calculation

The field strength is calculated by adding the Antenna Factor and Cable Factor. Then by subtracting the Amplifier Gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

FS = RA + AF + CF - PA + DCF

Where  $FS = Field Strength in dB (\mu V/m)$ 

RA = Receiver Amplitude (including preamplifier) in dB ( $\mu V$ )

CF = Cable Attenuation Factor in dB AF = Antenna Factor in dB (1/m) PA= Preamplifier Factor in dB

DCF = Distance Correction Factor dB (for measurements made at X meters when compared to Y meter limits,  $40\log(X/Y)$  for below 30MHz and  $20\log(X/Y)$  for

above 30MHz)

Assume a receiver reading of 52.0 dB ( $\mu V$ ) is obtained. The antenna factor of 7.4 dB and cable factor of 1.6 dB is added. The amplifier gain of 29 dB is subtracted and the Distance Correction Factor of 10.5 dB is added, giving field strength of 42.5 dB ( $\mu V/m$ ).

 $RA = 52.0 \text{ dB } (\mu V)$ 

AF = 7.4 dB (1/m)

CF = 1.6 dB

PA = 29.0 dB

DCF = 10.5 dB

FS = RF + AF + CF - PA + DCF

FS = 52.0 + 7.4 + 1.6 - 29.0 + 10.5

 $FS = 42.5 \text{ dB } (\mu V/m)$ 

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### 2.4 Measurement Uncertainty

Compliance of the product is based on the measured value. However, the measurement uncertainty is included for informational purposes.

#### **Radiated Emission:**

The uncertainty in the measured field strength is estimated as follows, for a minimum confidence probability of  $95\,\%$ 

Freq. Range	<b>Detection Mode</b>	Uncertainty
30 MHz to 200 MHz	Quasi-peak	± 5.1 dB
200 MHz to 1000 MHz	Quasi-peak	± 4.1 dB
1 GHz to 18 GHz	Average/Peak	-4.6 / +4.92

#### **Conducted Emission:**

The uncertainty in the measured voltage is estimated as follows, for a minimum confidence probability of 95%

Freq. Range	<b>Detection Mode</b>	Uncertainty
9 kHz to 150 kHz	Average	± 2.5 dB
	Quasi-peak	± 2.8 dB
150 kHz to 30 MHz	Average	± 2.5 dB
	Quasi-peak	± 2.8 dB

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### 3.0 Emissions Test Results

### 3.1 Transmitter Radiated Emissions

FCC: 15.209

#### 3.1.1 Test Limits

## Limits for Electromagnetic Radiated Disturbance, FCC Section 15.209(b)

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field strength (microvolts/meter)	Measurement distance (meters)
0.009-0.490	2400/F(kHz)	300
0.490-1.705	24000/F(kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3

In addition, the level of any unwanted emissions from an intentional radiator operating under these general provisions shall not exceed the level of the fundamental emission.

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#### 3.1.2 Test Procedure

Radiated emission measurements were performed from 9 kHz to 30 MHz with the Spectrum Analyzer Resolution Bandwidth of 200 Hz. In the frequency range from 9 kHz to 30 MHz the Quasi-peak value of the Field Strength (FS) is measured. The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole.

The EUT is placed on a plastic turntable that is 80 cm in height. If the EUT attaches to peripherals, they are connected and operational (as typical as possible). During testing, all cables were manipulated to produce worst-case emissions. The signal is maximized through rotation. The antenna height and polarization are varied during the search for maximum signal level. The antenna height is varied from 1 to 4 meters.

Radiated emissions are taken at one meter for frequencies below 30MHz. An inverse proportionality factor of 40 dB per decade is used to normalize the measured data to the FCC specified distance for determining compliance.

Data is included of the worst-case configuration (the configuration which resulted in the highest emission levels).

Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4.

Tested By:	Jainu Jogani
Test Date:	November 08, 2013

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### 3.1.3 Test Results

The EUT met the radiated disturbance requirements of FCC 15.209.

## Radiated Disturbance, FCC 15.209

Frequency	FS at 1m	FS at distance per 15.209	Limit per 15.209	Margin	RA at 1m	CF	PA	AF	Measurement Distance as per 15.209	DCF
Hz	dB(uV/m)	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB	dB(1/m)	meters	dB
123850	88.0	-11.1	25.7	-36.8	56.2	0.0	32.2	63.9	300.0	-99.1
247700	46.3	-52.8	19.7	-72.5	19.9	0.1	32.2	58.5	300.0	-99.1
371550	63.1	-36.0	16.2	-52.2	40.1	0.1	32.1	55.1	300.0	-99.1
495400	34.7	-24.4	33.7	-58.1	14.2	0.1	32.1	52.6	30.0	-59.1
619250	49.6	-9.5	31.8	-41.2	31.1	0.1	32.1	50.6	30.0	-59.1
743100	28.1	-31.0	30.2	-61.2	11.0	0.1	32.1	49.2	30.0	-59.1
866950	44.0	-15.1	28.8	-43.9	28.2	0.1	32.1	47.8	30.0	-59.1
990800	25.4	-33.7	27.7	-61.4	10.6	0.1	32.1	46.8	30.0	-59.1
1114650	39.7	-19.4	26.7	-46.0	25.6	0.1	32.1	46.1	30.0	-59.1
1238500	24.9	-34.2	25.7	-59.9	11.5	0.1	32.1	45.4	30.0	-59.1
1362350	36.4	-22.7	24.9	-47.6	23.6	0.1	32.1	44.7	30.0	-59.1
1486200	23.0	-36.1	24.2	-60.2	10.9	0.1	32.1	44.1	30.0	-59.1
1610050	33.1	-26.0	23.5	-49.4	21.6	0.1	32.1	43.4	30.0	-59.1
1733900	21.6	-37.5	29.5	-67.0	10.9	0.1	32.1	42.7	30.0	-59.1
1857750	31.7	-27.4	29.5	-56.9	21.6	0.1	32.1	42.1	30.0	-59.1
2105450	28.9	-30.2	29.5	-59.7	19.9	0.1	32.1	41.0	30.0	-59.1
2353150	26.5	-32.6	29.5	-62.1	18.3	0.1	32.1	40.2	30.0	-59.1
2477000	18.6	-40.5	29.5	-70.0	10.8	0.2	32.1	39.8	30.0	-59.1
2600850	26.3	-32.8	29.5	-62.3	18.8	0.2	32.1	39.4	30.0	-59.1

Results: Complies by 36.8 dB

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## 3.1.4 Test Configuration Photographs

The following photographs show the testing configurations used.

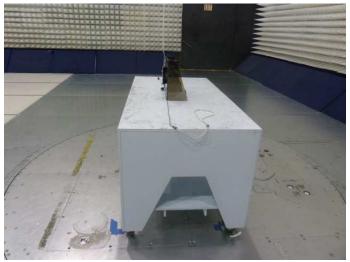


Electromagnetic Radiated Disturbance Setup Photograph



## 3.1.4 Test Configuration Photograph (Continued)





Electromagnetic Radiated Disturbance Setup Photograph



## 3.2 Radiated Emissions from Digital Parts

FCC: 15.109

#### 3.2.1 Test Limits

Limits for Electromagnetic Radiated Disturbance, FCC Section 15.109(b)

Frequency (MHz)	Class A at 10m dB(μV/m)	Class B at 3m dB(μV/m)
30-88	39.0	40.0
88-216	43.5	43.5
216-960	46.4	46.0
Above 960	49.5	54.0

Note: Three sets of units are commonly used for EMI measurement, decibels below one milliwatt (-dBm), decibels above a microvolt (dB $\mu$ V), and microvolts ( $\mu$ V). To convert between them, use the following formulas:  $20 \ LOG_{10}(\mu$ V) = dB $\mu$ V, dBm = dB $\mu$ V-107

Alternative limits per Section 15.109(g):

Radiated Emissions Limits, CISPR 22

Frequency (MHz)	Class A at 10m dB(μV/m)	Class B at 10m dB(μV/m)
30-230	40.0	30.0
230-1000	47.0	37.0

Note: The lower limit shall apply at the transition frequency.

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#### 3.2.2 Test Procedure

Measurements of the radiated field in the frequency range of 30 MHz to 1000 MHz are made with the antenna located at a distance of 10 meters from the EUT and measurements in the frequency range above 1000 MHz are made with the antenna located at a distance of 3 meters from the EUT. The measuring receiver meets the requirements of Section One of CISPR 16 and the measuring antenna correlates to a balanced dipole.

Measurements of the radiated field below 1000 MHz are made with the antenna located at a distance of 10 meters from the EUT. If the field-strength measurements at 10m cannot be made because of high ambient noise level or for other reasons, measurements of Class B equipment may be made at a closer distance, for example 3m. An inverse proportionality factor of 20 dB per decade should be used to normalize the measured data to the specified distance for determining compliance.

The antenna is adjusted between 1m and 4m in height above the ground plane for maximum meter reading at each test frequency.

The antenna-to-EUT azimuth is varied during the measurement to find the maximum field-strength readings.

The antenna-to-EUT polarization (horizontal and vertical) is varied during the measurements to find the maximum field-strength readings.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. The table is constructed of non-conductive materials.

Floor standing EUTs are placed on a horizontal metal ground plane and isolated from the ground plane by 3 to 12 mm of insulating material.

Equipment setup for radiated disturbance tests followed the guidelines of ANSI C63.4.

Tested By:	Anderson Soungpanya
Test Date:	October 28, 2013

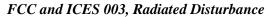
EMC Report for NovaSom, Inc. on COC2013

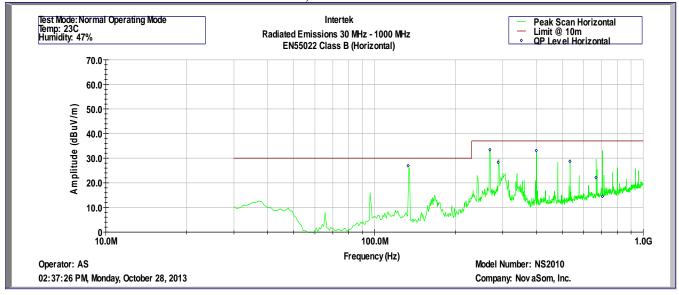
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#### 3.2.3 Test Results

The EUT met the radiated disturbance requirements of FCC and ICES 003 for a Class B device.





Intertek Radiated Emissions 30 MHz - 1000 MHz EN55022 Class B (QP-Horizontal)

Operator: AS October 28, 2013 Model Number: NS2010 with sensors

Company: NovaSom, Inc.

Frequency	Quasi Pk FS	Limit@10m	Margin	RA	AG	AF	CF
Hz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)	dB
1.33E+08	26.9	30.0	-3.1	47.4	32.0	10.9	0.7
2.69E+08	33.4	37.0	-3.6	51.6	32.0	12.9	1.0
2.89E+08	28.4	37.0	-8.6	46.7	32.0	12.6	1.0
4.00E+08	33.1	37.0	-3.9	48.9	32.0	15.1	1.2
5.33E+08	28.7	37.0	-8.3	42.0	32.2	17.6	1.4
6.67E+08	22.2	37.0	-14.8	33.9	32.3	19.0	1.5
7.05E+08	14.5	37.0	-22.5	25.7	32.3	19.5	1.6

Test Mode: Normal Operating Mode

Temp: 23C Humidity: 47%

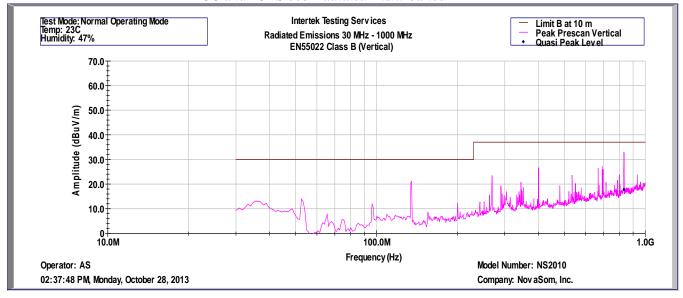
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#### 3.1.3 Test Results

#### FCC and ICES 003 Radiated Disturbance



Intertek Radiated Emissions 30 MHz - 1000 MHz EN55022 Class B (QP-Vertical)

Operator: AS Model Number: NS2010 with sensors

October 28, 2013 Company: NovaSom, Inc.

Frequency	Quasi Pk FS	Limit@10m	Margin	RA	AG	AF	CF
Hz	dB(uV/m)	dB(uV/m)	dB	dB(uV)	dB	dB(1/m)	dB
8.33E+08	17.8	37.0	-19.2	27.4	32.0	20.8	1.7

Test Mode: Normal Operating Mode

Temp: 23C Humidity: 47%

Results: Complies by 3.1 dB

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## 3.1.4 Test Configuration Photographs

The following photographs show the testing configurations used.

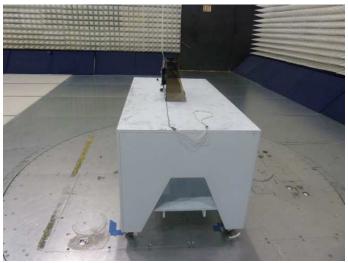


Electromagnetic Radiated Disturbance Setup Photograph



## 3.1.4 Test Configuration Photograph (Continued)





Electromagnetic Radiated Disturbance Setup Photograph



## 3.2 AC Mains Line-Conducted Disturbance

FCC: 15.207, 15.107

### 3.2.1 Test Limits

Limits for Electromagnetic Conducted Disturbance, FCC Section 15.207& 15.107

Frequency Band	Class B Limit dB (µV)			
MHz	Quasi-Peak	Average		
	66 to 56	56 to 46		
0.15-0.50	Decreases linearly with the logarithm	Decreases linearly with the logarithm		
	of the frequency	of the frequency		
0.50-5.00	56	46		
5.00-30.00	60	50		

*Note:* At the transition frequency the lower limit applies.

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#### 3.2.2 Test Procedure

Measurements are carried out using quasi-peak and average detector receivers in accordance with CISPR 16. An AMN is required to provide a defined impedance at high frequencies across the power feed at the point of measurement of terminal voltage and also to provide isolation of the circuit under test from the ambient noise on the power lines. An AMN as defined in CISPR 16 shall be used.

The EUT is located so that the distance between the boundary of the EUT and the closest surface of the AMN is 0.8m.

Where a flexible mains cord is provided by the manufacturer, this shall be 1m long or if in excess of 1m, the excess cable is folded back and forth as far as possible so as to form a bundle not exceeding 0.4m in length.

The EUT is arranged and connected with cables terminated in accordance with the product specification.

Conducted disturbance is measured between the phase lead and the reference ground, and between the neutral lead and the reference ground. Both measured values are reported.

The EUT, where intended for tabletop use, is placed on a table whose top is 0.8m above the ground plane. A vertical, metal reference plane is placed 0.4m from the EUT. The vertical metal reference-plane is at least 2m by 2m. The EUT shall be kept at least 0.8m from any other metal surface or other ground plane not being part of the EUT. The table is constructed of non-conductive materials.

Floor standing EUTs are placed on a horizontal metal ground plane and isolated from the ground plane by 3 to 12 mm of insulating material. The metal ground plane extends at least 0.5m beyond the boundaries of the EUT and has minimum dimensions of 2m by 2m.

Equipment setup for conducted disturbance tests followed the guidelines of ANSI C63.4.

Tested By:	Jainu Jogani
Test Date:	November 08, 2013

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#### 3.2.3 Test Results

Operator: JJ

The EUT met the conducted disturbance requirement of FCC and ICES 003 for a Class B device.

FCC and ICES 003 Conducted Disturbance at AC Mains Test Mode: Transmitting Mode and Charging Mode, 120V 60Hz Temp: 23C, Humidity: 47% Line Conducted Emissions 150 kHz - 30 MHz EN 55022 Class B (Line 1) 90.0<sub>±</sub> 80.0 70.0 Amplitude (dBuV) 60.0 50.0 40.0 30.0 20.0 10.0 0<sup>‡</sup> 100.0K 1.0M 10.0M 100.0M Frequency (Hz)

Intertek Testing Services Line Conducted Emissions 150 kHz - 30 MHz EN 55022 Class B (Line 1)

Operator: JJ 07:49:16 PM, Friday, November 08, 2013

07:49:16 PM, Friday, November 08, 2013

Model Number: NS2010 with sensors

Model Number: NS2010

Company: Nov aSom, Inc.

Company: NovaSom, Inc.

Frequency	Av Level	QP Level	Av Limit	QP Limit	Av Margin	QP Margin
Hz	dBuV	dBuV	dBuV	dBuV	dB	dB
194698	34.8	47.4	54.7	64.7	-20.0	-17.4
262192	30.0	42.4	52.8	62.8	-22.8	-20.4

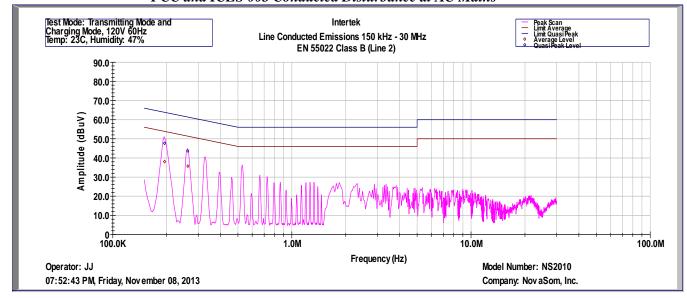
Test Mode: Transmitting Mode and Charging Mode, 120V 60Hz Temp: 23C, Humidity: 47%

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#### FCC and ICES 003 Conducted Disturbance at AC Mains



Intertek Testing Services Line Conducted Emissions 150 kHz - 30 MHz EN 55022 Class B (Line 2)

Operator: JJ 07:49:16 PM, Friday, November 08, 2013 Model Number: NS2010 with sensors

Company: NovaSom, Inc.

Frequency	Av Level	QP Level	Av Limit	QP Limit	Av Margin	QP Margin
Hz	dBuV	dBuV	dBuV	dBuV	dB	dB
194793	38.1	47.7	54.7	64.7	-16.6	-17.0
262575	35.7	43.7	52.8	62.8	-17.0	-19.1

Test Mode: Transmitting Mode and Charging Mode, 120V 60Hz Temp: 23C, Humidity: 47%

Results: Complies by 10.4dB

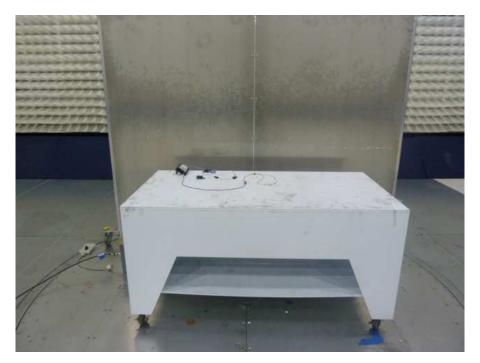
EMC Report for NovaSom, Inc. on COC2013

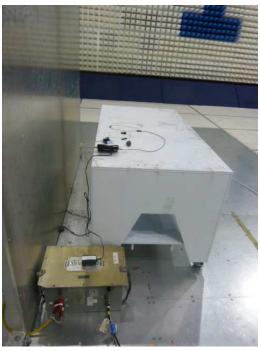
File: 101310621MPK-008 Page 25 of 27



## 3.2.4 Test Configuration Photographs

The following photographs show the testing configurations used.





AC Mains Line-Conducted Disturbance Setup Photograph



## 4.0 Document History

Revision/ Job Number	Writer Initials	Reviewer Initials	Date	Change
1.0 /G101310621	JJ	KK	November 11, 2013	Original document