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Report No.: SZEM180600535606  
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# RF Exposure Evaluation Report

**Application No.:** SZEM1806005356CR  
**Applicant / Manufacturer** Sensoro Co., Ltd.  
**Address of Applicant / Manufacturer** Room 2807, Building 1B, Wangjing SOHO, No.10, Wangjing Street, Chaoyang District, Beijing, China  
**Factory:** Sensoro Co., Ltd.  
**Address of Factory:** Room 2807, Building 1B, Wangjing SOHO, No.10, Wangjing Street, Chaoyang District, Beijing, China  
**Equipment Under Test (EUT):**  
**EUT Name:** α Gateway  
**Model No.:** GW-1209  
**Trade Mark:** SENSORO  
**FCC ID:** 2ADYO-S001209  
**Standards:** 47 CFR Part 1.1307  
 47 CFR Part 1.1310  
**Date of Receipt:** 2018-06-27  
**Date of Test:** 2018-07-03 to 2018-07-22  
**Date of Issue:** 2018-07-25

<b>Test Result:</b>	<b>PASS*</b>
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\* In the configuration tested, the EUT complied with the standards specified above.



Keny Xu  
EMC Laboratory Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.

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**SGS-CSTC Standards Technical Services Co., Ltd.**  
**Shenzhen Branch**

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## 2 Version

<i>Revision Record</i>				
<i>Version</i>	<i>Chapter</i>	<i>Date</i>	<i>Modifier</i>	<i>Remark</i>
01		2018-07-25		Original

<b>Authorized for issue by:</b>				
				
		_____ <b>Harry Wu /Project Engineer</b>		
				
		_____ <b>Eric Fu /Reviewer</b>		



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## 4 General Description of EUT

Power supply:	AC/DC Adapter Model: GP304C-120-200 Input: AC100-240V, 50/60Hz, 1A Max Output: DC12V, 2A
<b>For BLE:</b>	
Bluetooth Version:	V4.0
Operation Frequency	2402MHz to 2480MHz
Channel Spacing	2MHz
Modulation Type	GFSK
Number of Channels	40
Antenna Gain	2.5dBi
Antenna Type	Integral Antenna
<b>For 2.4G wifi:</b>	
Channel Spacing	5MHz
Modulation Type	802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Number of Channels	802.11b/g/n(HT20):11 802.11n(HT40):7
Operation Frequency	802.11b/g/n(HT20): 2412MHz to 2462MHz 802.11n(HT40): 2422MHz to 2452MHz
Antenna Gain	3dBi
Antenna Type	External Antenna
<b>For 902.3-927.5MHz:</b>	
Operation Frequency:	902.3-927.5MHz
Modulation Type:	CSS
Number of Channels:	16
Antenna Gain:	1.5dBi
Antenna Type:	External Antenna
<b>For 4G LTE:</b>	
LTE Operation Frequency Band:	LTE FDD Band 2, 4, 5,13, 17
Modulation Type:	QPSK, 16QAM
LTE Release Version:	R9
LTE Power Class:	Level 3



Antenna Type:	External	
Antenna Ports:	Tx & Rx Port	1
	Tx-only Port	0
	Rx-only Port	1
Antenna Gain:	3dBi	
Extreme temp. Tolerance:	-20 °C to +55 °C	



## 4.1 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch

No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

## 4.2 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **CNAS (No. CNAS L2929)**

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **A2LA (Certificate No. 3816.01)**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

- **VCCI**

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

- **FCC –Designation Number: CN1178**

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.

Designation Number: CN1178. Test Firm Registration Number: 406779.

- **Industry Canada (IC)**

Two 3m Semi-anechoic chambers and the 10m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab have been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1, 4620C-2, 4620C-3.

## 4.3 Deviation from Standards

None.

## 4.4 Abnormalities from Standard Conditions

None.

## 4.5 Other Information Requested by the Customer

None.



## 5 RF Exposure Evaluation

### 5.1 RF Exposure Compliance Requirement

#### 5.1.1 Limits

According to FCC Part1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in part1.1307(b)

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposures</b>				
0.3–3.0 .....	614	1.63	*(100)	6
3.0–30 .....	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30–300 .....	61.4	0.163	1.0	6
300–1500 .....	.....	.....	f/300	6
1500–100,000 .....	.....	.....	5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3–1.34 .....	614	1.63	*(100)	30
1.34–30 .....	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30–300 .....	27.5	0.073	0.2	30
300–1500 .....	.....	.....	f/1500	30
1500–100,000 .....	.....	.....	1.0	30

F= Frequency in MHz

Friis Formula

Friis transmission formula:  $Pd = (Pout * G) / (4 * \pi * R^2)$

Where

Pd = power density in mW/cm<sup>2</sup>

Pout = output power to antenna in mW

G = gain of antenna in linear scale

$\pi = 3.1416$

R = distance between observation point and center of the radiator in cm

Pd is the limit of MPE, 1 mW/cm<sup>2</sup>. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

#### 5.1.2 Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.



5.1.3 EUT RF Exposure Evaluation

For BLE

ANT: 2.5dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.78 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Frequency (MHz)	Declared Max Average Output Power (including tune-up tolerance ) (dBm)	Output Power to Antenna(mW)	Power Density at R = 20 cm (mW/cm2)	Limit	Result
2402MHz	4.0	2.512	0.0005	1.0	PASS

Note: Refer to Tune-up information for EUT Declared Max. Average Peak Output Power value.

The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

For 2.4G WiFi

ANT: 3dB

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.00 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Frequency (MHz)	Declared Max Conducted Output Power (including tune-up tolerance ) (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm2)	Limit	Result
2412MHz	19.0	79.433	0.02697	1.0	PASS

Note: Refer to Tune-up information for EUT Declared Max. Average Peak Output Power value.

The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

For 4G LTE

ANT.: 3dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.00 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Test mode	Frequency (MHz)	Declared Max Average Output Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm2)	Limit	Result
Band 2	1860.0	24.0	251.189	0.05	1.0	PASS
Band 4	1715.0	24.0	251.189	0.05	1.0	PASS
Band 5	824.7	24.0	251.189	0.05	0.55	PASS
Band 13	779.5	24.0	251.189	0.05	0.52	PASS
Band 17	706.5	24.0	251.189	0.05	0.47	PASS

Note: Refer to Refer to Tune-up information for EUT Declared Max. Average Peak Output Power value.

The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.





**For IoT-WAN**

ANT: 1.5dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.41 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Frequency (MHz)	Declared Max Average Output Power (including tune-up tolerance ) (dBm)	Output Power to Antenna(mW)	Power Density at R = 20 cm (mW/cm <sup>2</sup> )	Limit	Result
902.3MHz	-14.0	0.040	0.000008	0.6	PASS

Note: Refer to Tune-up information for EUT Declared Max. Average Peak Output Power value.

The distancer (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

The simultaneous transmission result between of BLE,2.4G WiFi, 4G LTE and IoT-WAN x2 :

The SAR Exclusion Threshold Level:

$$=CPD1 / LPD1 + CPD2 / LPD2 + CPD3 / LPD3 + CPD4 / LPD4 + CPD5 / LPD5$$

(CPD = Calculation power density, LPD = Limit of power density)

$$= (0.0005/1) +(0.02697/1) +(0.05/0.47) +(0.000008/0.6) +(0.000008/0.6)= 0.1338527 < 0.47$$

Since the source-based time-averaging conducted output power is well below the SAR low threshold level, so the EUT is considered to comply with SAR requirement without testing.

- End of the Report -