1 Cover Page

RF Exposure Report

Application No.:	SZCR2309003182AT
Applicant:	SYBER SENSE IOT COMPANY LIMITED
Address of Applicant:	FLAT/RM 10 BLK A 16/F HI TECH INDUSTRIAL CENTRE 5-21 PAK TIN PAR STREET TSUEN WAN Hong Kong China
Manufacturer:	SYBER SENSE IOT COMPANY LIMITED
Address of Manufacturer:	FLAT/RM 10 BLK A 16/F HI TECH INDUSTRIAL CENTRE 5-21 PAK TIN PAR STREET TSUEN WAN Hong Kong China
Factory:	RUI CHUANG KE DIGITAL CO., LTD
Address of Factory:	3F, A building, C Area, Shiwei Datianyang Industry Zone, Shiwei Community, Matian Street, Guangming District, 518000 Shenzhen, China
Equipment Under Test (EUT):	
EUT Name:	SS security panel
Model No.:	XP02US-SS-1433-00
FCC ID:	2AVDCXP02US-SS-1433
Standard(s) :	FCC Rules 47 CFR §2.1091 KDB 447498 D04 interim General RF Exposure Guidance v01
Date of Receipt:	2023-09-27
Date of Test:	2023-10-07 to 2023-10-12
Date of Issue:	2023-10-16
Test Result:	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

Keny Xu
EMC Laboratory Manager

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2023-10-16		Original

Authorized for issue by:				
		Leo Li **Leo Li/Project Engineer**		
		Eric Fu **Eric Fu/Reviewer**		

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3 General Information

3.1 General Description of E.U.T.

Product Type:	☐ Portable device
	☒ Mobile device
	☐ Fixed device

3.2 Details of E.U.T.

Power supply:	DC 12V from adapter input AC 120V/60Hz Adapter Model: SW-120250 Input: 100-240V~50/60Hz 0.68A Max Output: DC 12V 2500mA Lithium Ion Battery: 3.7V 3600mAh rechargeable battery which charged by adapter
Cable:	DC cable: 185cm unshielded Type-C to RJ45 cable: 17cm unshielded
For 433.95MHz:	
Operation Frequency:	433.95MHz
Modulation Type:	OOK
Number of Channels:	1
Antenna Type:	FPC Antenna
Antenna Gain:	-2.61dBi
For Z-WAVE:	
Operation Frequency:	908.4MHz, 916MHz
Modulation Type:	FSK; GFSK
Number of Channels:	2
Antenna Type:	Inverted-F Antenna
Antenna Gain:	3dBi
For BLE:	
Bluetooth Version:	V4.1 LE

Operation Frequency	2402MHz to 2480MHz
Channel Spacing	2MHz
Modulation Type	GFSK
Number of Channels	40
Antenna Gain	3.00dBi
Antenna Type	Dipole Antenna
For 2.4G wifi:	
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	3.00dBi
Antenna Type	Dipole Antenna
For 5G Wifi:	
Operation Frequency:	Band I: 5150-5250MHz Band II: 5230-5320MHz Band III: 5500-5700MHz Band IV: 5725-5850MHz
Modulation Type:	CCK,DQPSK,DBPSK for 802.11a 64-QAM,16-QAM,QPSK,BPSK for 802.11n 256-QAM, 64-QAM,16-QAM,QPSK,BPSK for 802.11ac
Channel Bandwidth:	802.11a:20MHz 802.11n:40MHz 802.11ac:80MHz
Antenna Gain:	4.00dBi
Antenna Type:	Dipoe Antenna
For 4G LTE:	
LTE Operation	LTE FDD Band 2, 4, 5, 7, 12, 13, 25, 26

Frequency Band:	
Modulation Type:	QPSK, 16QAM
Frequency Range	LTE Band 2: Tx:1850.7-1909.3MHz, Rx:1930.7-1989.3MHz LTE Band 4: Tx:1710.7-1754.3MHz, Rx:2110.7-2154.3MHz LTE Band 5: Tx:824.7-848.3MHz, Rx:869.7-893.3MHz LTE Band 7: Tx:2502.5-2567.5MHz, Rx:2622.5-2687.5MHz LTE Band 12: Tx:699.7-715.3MHz, Rx:729.7-745.3MHz LTE Band 13: Tx:779.5-784.5MHz, Rx:748.5-753.5MHz LTE Band 25 Tx:1850.7-1914.3MHz, Rx:1930.7-1994.3MHz LTE Band 26: Tx:824.7-848.3MHz, Rx:869.7-893.3MHz
Antenna Type:	Dipole Antenna
Antenna Gain:	LTE Band 2: 2.00dBi LTE Band 4: 2.00dBi LTE Band 5: 2.00dBi LTE Band 7: 3.00dBi LTE Band 12: 3.00dBi LTE Band 13: 4.00dBi LTE Band 25: 2.00dBi LTE Band 26: 2.00dBi

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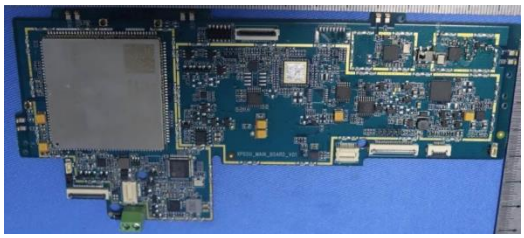
Remark:

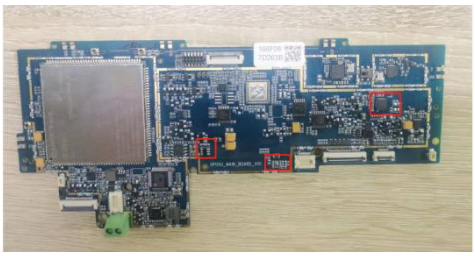
This test report (Ref. No.: SZCR230900318201) is only valid with the original test report (Ref. No.: SZCR210502114701).

According to the declaration from the applicant, the models in this report and models in original report were identical, only difference on the board, and changed the information of manufacturer and product name, deleted trade mark.

The detail difference on the board is as below:

Differences:		
Description	**Before**	**After**
1.PCBA Version	V01	V03
2.Add encryption chip	NO	ALPU-C (NEOWINE)
3. 433 MCU	NUC029ZAN (NUVOTON)	M031TD2AE (NUVOTON)
4.Remove Fuel gauge IC	MAX17260	DNP
5.4G diversity antenna	XP05U-4G-DIV-V2.0	XP05U-4G-DIV-V2.0 AV
6.433 antenna	XP05-433-V2.0	XP05-433-V3.0





Before

After

LTE diversity antenna(old) (receive function)

LTE diversity antenna(New) (receive function)

433.95MHz antenna(old)

433.95MHz antenna(New)

Separation Distance

Minimum test separation distance:	20cm
Remark: This minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander.	

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3.3 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, Nanshan District, Shenzhen, Guangdong, China. 518057.

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

No tests were sub-contracted.

3.4 Test Facility

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

• 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 (Member No. 1937)

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. Shenzhen EMC laboratory 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: CN1336

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

Designation Number: CN1336. Test Firm Registration Number: 787754.

• Innovation, Science and Economic Development Canada

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

CAB identifier: CN0006.

IC#: 4620C.

4 FCC Radiofrequency radiation exposure limits

Test exemptions apply for devices used in general population/uncontrolled exposure environments, according to the SAR-based, or MPE-based exemption thresholds.

4.1 Blanket 1 mW Blanket Exemption

The 1 mW Blanket Exemption of §1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance.

The 1-mW blanket exemption applies at separation distances less than 0.5 cm, including where there is no separation. This exemption shall not be used in conjunction with other exemption criteria other than those for multiple RF sources in paragraph §1.1307(b)(3)(ii)(A).

The 1-mW exemption is independent of service type and covers the full range of 100 kHz to 100 GHz, but it shall not be used in conjunction with other exemption criteria or in devices with higher-power transmitters operating in the same time-averaging period. Exposure from such higher-power transmitters would invalidate the underlying assumption that exposure from the lower-power transmitter is the only contributor to SAR in the relevant volume of tissue.

4.2 MPE-based Exemption

General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 [Table 1 of §1.1307(b)(1)(i)(C)] to support an exemption from further evaluation from 300 kHz through 100 GHz.

Table B.1—Thresholds For Single RF Sources Subject to Routine Environmental Evaluation

RF Source Frequency			Minimum Distance			Threshold ERP
f_L MHz		f_H MHz	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W
0.3	–	1.34	159 m	–	35.6 m	1,920 R^2
1.34	–	30	35.6 m	–	1.6 m	3,450 R^2/f^2
30	–	300	1.6 m	–	159 mm	3.83 R^2
300	–	1,500	159 mm	–	31.8 mm	0.0128 R^2f
1,500	–	100,000	31.8 mm	–	0.5 mm	19.2R^2
Subscripts L and H are low and high; λ is wavelength. From §1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.						

The table applies to any RF source (i.e. single fixed, mobile, and portable transmitters) and specifies power and distance criteria for each of the five frequency ranges used for the MPE limits. These criteria apply at separation distances from any part of the radiating structure of at least λ/2π. The thresholds are

based on the general population MPE limits with a single perfect reflection, outside of the reactive near-field, and in the main beam of the radiator.

For mobile devices that are not exempt per Table B.1 [Table 1 of §1.1307(b)(1)(i)(C)] at distances from 20 cm to 40 cm and in 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in §1.1310 is necessary if the ERP of the device is greater than ERP_{20cm} in Formula (B.1) [repeated from §2.1091(c)(1); also in §1.1307(b)(1)(i)(B)].

$$P_{\text{th}}\ (\text{mW}) = ERP_{20\ \text{cm}}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases} \qquad (\text{B.1})$$

If the ERP is not easily obtained, then the available maximum time-averaged power may be used (i.e., without consideration of ERP only if the physical dimensions of the radiating structure(s) do not exceed the electrical length of λ/4 or if the antenna gain is less than that of a half-wave dipole.

SAR-based exemptions are constant at separation distances between 20 cm and 40 cm to avoid discontinuities in the threshold when transitioning between SAR-based and MPE-based exemption criteria at 40 cm, considering the importance of reflections.

Limit calculation			
Frequency range	Frequency(MHz)	R(λ/2π)(m)	Threshold ERP(W)
300~1500MHz	**915**	0.0522	0.032
1500~100000MHz	**2480**	0.0193	0.007

4.3 SAR-based Exemption

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.

If the ERP of a device is not easily determined, such as for a portable device with a small form factor, the applicant may use the available maximum time-averaged power exclusively if the device antenna or radiating structure does not exceed an electrical length of λ/4.

As for devices with antennas of length greater than λ/4 where the gain is not well defined, but always less than that of a half-wave dipole (length λ/2), the available maximum time-averaged power generated by the device may be used in place of the maximum time-averaged ERP, where that value is not known.

The separation distance is the smallest distance from any part of the antenna or radiating structure for all persons, during operation at the applicable ERP. In the case of mobile or portable devices, the separation distance is from the outer housing of the device where it is closest to the antenna.

The SAR-based exemption formula of §1.1307(b)(3)(i)(B), repeated here as Formula (B.2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (mW).

This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula (B.2).

$$P_{\text{th}}\ (\text{mW}) = \begin{cases} ERP_{20\ \text{cm}}(d/20\ \text{cm})^{x} & d \le 20\ \text{cm} \\ ERP_{20\ \text{cm}} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases} \qquad \text{(B.2)}$$

where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ \text{cm}}\sqrt{f}}\right)$$

and f is in GHz, d is the separation distance (cm), and ERP_{20cm} is per Formula (B.1).

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Example values shown in Table B.2 are for illustration only.

Table B.2—Example Power Thresholds (mW)

Frequency (MHz)	Distance(mm)									
	5	10	15	20	25	30	35	40	45	50
300	39	65	88	110	129	148	166	184	201	217
450	22	44	67	89	112	135	158	180	203	226
835	9	25	44	66	90	116	145	175	207	240
1900	3	12	26	44	66	92	122	157	195	236
2450	3	10	22	38	59	83	111	143	179	219
3600	2	8	18	32	49	71	96	125	158	195
5800	1	6	14	25	40	58	80	106	136	169

Limit calculation				
Frequency range(GHz)	Frequency(GHz)	X	Distance(cm)	Pth (mW)
0.3~1.5	**0.915**	1.474	**0.5**	**8.133**
1.5~6	**2.48**	1.905	**0.5**	**2.717**

5 Measurement and Calculation

5.1 Maximum transmit power

For BLE:

Antenna Gain: 3.00dBi

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

Maximum Conducted Power [dBm]	Maximum Conducted Power [mW]	Maximum EIRP [dBm]	Maximum EIRP [mW]
3.09	2.04	6.09	4.06

Note: Refer to Report: FA741007B.

For 2.4G WiFi

Antenna Gain: 3.00dBi

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

Maximum Conducted Power [dBm]	Maximum Conducted Power [mW]	Maximum EIRP [dBm]	Maximum EIRP [mW]
22.11	162.55	25.11	324.34

Note: Refer to Report: FA741007C.

For 5G WiFi

Antenna Gain: 4.00dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.51 in linear scale.

Maximum Conducted Power [dBm]	Maximum Conducted Power [mW]	Maximum EIRP [dBm]	Maximum EIRP [mW]
13.91	24.60	17.91	61.80

Note: Refer to Report: FA741007D.

For 4G LTE

Test mode	Antenna Gain (dBi)	Antenna Gain In linear	Frequency (MHz)	Declared Max Average Output Power (dBm)	Output Power to Antenna (mW)	Maximum EIRP [dBm]	Maximum EIRP [mW]
Band 2	2.00	1.58	1850.7	23.54	225.94	25.54	358.10
Band 4	2.00	1.58	1710.7	23.81	240.44	25.81	381.07
Band 5	2.00	1.58	824.7	23.50	223.87	25.50	354.81
Band 7	3.00	2.00	2502.5	24.08	255.86	27.08	510.50
Band 12	3.00	2.00	699.7	23.64	231.21	26.64	461.32
Band 13	4.00	2.51	779.5	23.55	226.46	27.55	568.85
Band 25	2.00	1.58	1850.7	23.51	224.39	25.51	355.63
Band 26	2.00	1.58	814.7	23.41	219.28	25.41	347.54

For 433.95MHz

The Power Data is based on the RF Test Report SZCR230900318202.

The Max. power (including tune-up tolerance) is -10.86dBm on the channel 0.43395GHz(*)

-10.86dBm logarithmic terms convert to numeric result is nearly 0.0000821mW

For 908.4MHz

The Power Data is based on the RF Test Report SZCR230900318203.

The Max. power (including tune-up tolerance) is -5.45dBm on the channel 0.9084GHz(*)

-5.45dBm logarithmic terms convert to numeric result is nearly 0.000285mW

For 916MHz

The Power Data is based on the RF Test Report SZCR230900318203.

The Max. power (including tune-up tolerance) is -5.42dBm on the channel 0.916GHz(*)

-5.42dBm logarithmic terms convert to numeric result is nearly 0.000287mW

Note: EIRP = pt × gt = (E×d)*2/49.2 (According to ANSI C63.10 Annex G.2).

ERP=EIRP-2.15dB

where

pt is the transmitter output power in watts

gt is the numeric gain of the transmitting antenna (dimensionless)

E is the electric field strength in V/m

d is the measurement distance in meters (m)

V/m =10^(((dBuV/m) -120) / 20)

5.2 RF Exposure Calculation

Remark: we used the EIRP between the conducted power and ERP/EIRP to perform RF exposure exemption evaluation.

	Evaluation method	Exempt Limit(mW)	Verdict
☐	Blanket 1 mW Blanket Exemption	1mW	N/A
☐	MPE-based Exemption(ERP)	7mW(ERP)	N/A
☒	SAR-based Exemption(P_{th})	3060mW	Yes

So, the device is to qualify for SAR test exemption, the exemption report is in lieu of the SAR report.

--End of the Report--

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