RF Exposure Evaluation Report

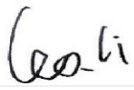
Application No.:	SZCR2105021147AT
Applicant:	SYBER SENSE IOT COMPANY LIMITED
Address of Applicant:	FLAT/RM 10 BLK A 16/F HI TECH INDUSTRIAL CENTRE 5-21 PAK TIN PAR STREET TSUEN WAN Hong Kong China
Manufacturer:	SYBER SENSE IOT COMPANY LIMITED
Address of Manufacturer:	5/F, Xiagu Building, Meishenghuigu Hi-tech Innovation Park, 83 Dabao Road, Baoan, Shenzhen, China.
Factory:	SYBER SENSE IOT COMPANY LIMITED
Address of Factory:	3/F, Building A, Hanhaida High-tech Park, DatianYang C District, Shiwei Community, Matian Street, Guangming New District, Shenzhen, China.
Equipment Under Test (EUT):	
EUT Name:	SS Security Panel
Model No.:	XP02US-SS-1433-00
Trade Mark:	Syber Sense
FCC ID:	2AVDCXP02US-SS-1433
Standards:	47 CFR Part 1.1307 47 CFR Part 1.1310 47 CFR Part 2.1091
Date of Receipt:	2021-06-09
Date of Test:	2021-06-12 to 2021-06-29
Date of Issue:	2021-06-30
Test Result:	**PASS***

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

Keny Xu
EMC Laboratory Manager

2 Version

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2021-06-30		Original

Authorized for issue by:				
				
		Harry Wu /Project Engineer		
				
		Eric Fu /Reviewer		

3 Contents

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4 General Description of EUT

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:	Inverted-F Antenna
Antenna Gain:	-2.5dBi
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 Frequency Band:	LTE FDD Band 2, 4, 5, 7, 12, 13, 25, 26
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

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:

• 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^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f^2)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f^2)	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/cm2

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 id the limit of MPE, 1 mW/cm2 . 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

Antenna Gain: 3.00dBi

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

Output Power Into Antenna & RF Exposure Evaluation Distance:

Max Conducted Output Power (including tune-up tolerance) (dBm)	Output Power to Antenna(mW)	Power Density at R = 20 cm (mW/cm2)	Limit (mW/cm2)	Result
3.09	2.04	0.0008	1.0	PASS

Note: Refer to Report: FA741007B.

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

For 2.4G WiFi

Antenna Gain: 3.00dBi

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

Output Power Into Antenna & RF Exposure Evaluation Distance:

Max Conducted Output Power (including tune-up tolerance) (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm2)	Limit (mW/cm2)	Result
22.11	162.55	0.0645	1.0	PASS

Note: Refer to Report: FA741007C.

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

For 5G WiFi

Antenna Gain: 4.00dBi

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

Output Power Into Antenna & RF Exposure Evaluation Distance:

Max Conducted Output Power (including tune-up tolerance) (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm2)	Limit (mW/cm2)	Result
13.91	24.60	0.012	1.0	PASS

Note: Refer to Report: FA741007D.

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

For 4G LTE

Output Power Into Antenna & RF Exposure Evaluation Distance:

Test mode	Antenna Gain (dBi)	Antenna Gain In linear	Frequency (MHz)	Declared Max Average Output Power (dBm)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm2) AUX ANT	Limit (mW/cm2)	Result
Band 2	2.00	1.58	1850.7	23.54	225.94	0.0710	1.0	PASS
Band 4	2.00	1.58	1710.7	23.81	240.44	0.0756	1.0	PASS
Band 5	2.00	1.58	824.7	23.50	223.87	0.0704	0.55	PASS
Band 7	3.00	2.00	2502.5	24.08	255.86	0.1018	1.0	PASS
Band 12	3.00	2.00	699.7	23.64	231.21	0.0920	0.47	PASS
Band 13	4.00	2.51	779.5	23.55	226.46	0.1131	0.52	PASS
Band 25	2.00	1.58	1850.7	23.51	224.39	0.0705	1.0	PASS
Band 26	2.00	1.58	814.7	23.41	219.28	0.0689	0.54	PASS

Note: Refer to Report: FG741007B.

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

For 433.95MHz

Antenna Gain: -2.5dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 0.56 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

Max field strength (dBuV/m)	EIRP (mW)	Power Density at R = 20 cm (mW/cm2)	Limit (mW/cm2)	Result
88.09	0.193	0.00004	0.29	PASS

Note: Refer to Report: SZCR210502114703.

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

Remark: refer to ANSI C63.10 Annex G,

G.2 Field strength approach (linear terms)

$$\mathrm{EIRP} = p_t \times g_t = (E \times d)^2 / 30$$

where

p_t is the transmitter output power in watts
g_t 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)

The Max. Field Strength of the Fundamental Signal in report SZCR210502114703 is 88.09dBuV/m=0.025380V/m, so EIRP=$(0.025380x3)^2/30$=0.00019324W=0.193mW

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For 908.4MHz

Antenna Gain: 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:

Max field strength (dBuV/m)	EIRP(mW)	Power Density at R = 20 cm (mW/cm2)	Limit (mW/cm2)	Result
91.93	0.468	0.00009	0.61	PASS

Note: Refer to Report: SZCR210502114702.

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

Remark: refer to ANSI C63.10 Annex G,

G.2 Field strength approach (linear terms)

$$\mathrm{EIRP} = p_t \times g_t = (E \times d)^2 / 30$$

where

p_t is the transmitter output power in watts
g_t 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)

The Max. Field Strength of the Fundamental Signal in report SZCR210502114702 is 91.93dBuV/m=0.039491V/m, so EIRP=$(0.039491 \times 3)^2/30$=0.00046786=0.468mW

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For 916MHz

Antenna Gain: 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:

Max field strength (dBuV/m)	EIRP(mW)	Power Density at R = 20 cm (mW/cm2)	Limit (mW/cm2)	Result
91.96	0.471	0.00009	0.61	PASS

Note: Refer to Report: SZCR210502114702.

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

Remark: refer to ANSI C63.10 Annex G,

G.2 Field strength approach (linear terms)

$$\mathrm{EIRP} = p_t \times g_t = (E \times d)^2 / 30$$

where

p_t is the transmitter output power in watts
g_t 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)

The Max. Field Strength of the Fundamental Signal in report SZCR210502114702 is 91.96dBuV/m=0.039628V/m, so EIRP=$(0.039628 \times 3)^2/30$=0.00047111W=0.471mW

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There are 5 Antennas in the EUT,WiFI/Bluetooth Antenna, Z Wave Antenna, 433.95MHz Antenna and two LTE antennas. Bluetooth,Wifi and LTE functions can't transmit at the same time.Bluetooth and Wifi can't transmit at the same time becase they share the same Antenna.

1.The simultaneous transmission result between of Antennas: WiFi, Z Wave and 433.95MHz :
The SAR Exclusion Threshold Level:
=CPD1 / LPD1 + CPD2 / LPD2 + CPD3 / LPD3
(CPD = Calculation power density, LPD = Limit of power density)
= (0.0645/1) + (0.00009/0.61) +(0.00004/0.29) = 0.0648 < 0.29

2.The simultaneous transmission result between of Antennas:LTE, Z-Wave and 433.95MHz :
The SAR Exclusion Threshold Level:
=CPD1 / LPD1 + CPD2 / LPD2 + CPD3 / LPD3
(CPD = Calculation power density, LPD = Limit of power density)
= (0.0920/0.47)+(0.00009/0.61) +(0.00004/0.29) = 0.1960 < 0.29
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.

Remark: for LTE, the worst case is transmitting the signal at 699.7MHz of Band 12 .

- End of the Report -

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