

SZEMC-TRF-01 Rev. A/0 Aug01,2022

Report No.: SZCR230800253204

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# **RF Exposure Report**

Test Result:	Pass*				
Date of Issue:	2023-08-29				
Date of Test:	2023-08-10 to 2023-08-22				
Date of Receipt:	2023-08-07				
Standard(s) :	FCC Rules 47 CFR §2.1093 KDB 447498 D04 interim General RF Exposure Guidance v01				
Model No.: Trade Mark: FCC ID:	EDF703001 EDIFIER,HECATE Z9G-EDF214				
EUT Name:	TRI-MODE MECHANICAL KEYBOARD				
Equipment Under Test (EU	Dongguan,Guangdong 523808, PR.China T):				
Address of Factory:	No.2 Gongyedong Road, Songshan Lake Sci&Tech Industry Park,				
Factory:	Technology 4th Road, Songshan Lake, Dongguan City, Guangdong Province, China Dongguan Edifier Technology Co., Ltd.				
Address of Manufacturer:	Room 2001, 20/F, D1 Building, Everbright We Valley, No. 15, Science and				
Manufacturer:	Dongguan Edifier Esports Technology Co., Ltd				
Address of Applicant:	P.O. Box 6264 General Post Office Hong Kong,				
Applicant:	Edifier International Limited				
Application No.:	SZCR2308002532AT				

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

Keny. Ku

Keny Xu EMC Laboratory Manager



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Revision Record								
Version	Chapter	Date	Modifier	Remark				
01		2023-08-29		Original				

Authorized for issue by:		
	Price Cherr	
	Bill Chen/Project Engineer	-
	Eric Fu	
	Eric Fu/Reviewer	-



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# 3 General Information

#### 3.1 General Description of E.U.T.

	M Portable device
	$\boxtimes$ Portable device
Product Type:	Mobile device
	Fixed device

#### 3.2 Details of E.U.T.

Keyboard:
Lithium Ion Battery: DC 3.7V 4000mAh 14.8Wh rechargeable battery which
charged by Type-C port
2402MHz to 2480MHz
V5.2 LE
GFSK
40
2MHz
1Mbps
On-board Antenna
1.5dBi
2402MHz to 2480MHz
GFSK
79
1MHz
On-board Antenna
1.5dBi

Remark: The information in this section is provided by the applicant or manufacturer, SGS is not liable to the accuracy, suitability, reliability or/and integrity of the information.





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#### 3.3 Separation Distance

 Minimum test separation distance:
 5mm

 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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#### 3.4 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 All tests were performed at:

#### 3.5 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.



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### 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.

RF Source Frequency			Minim	I hreshold ERP				
<i>f</i> ⊾ MHz	fLMHz f <sub>H</sub> MHz		λ∟ / 2π	λ <sub>H</sub> / 2π		W		
0.3	0.3 – 1.34		159 m	159 m –		1,920 R <sup>2</sup>		
1.34	1.34 – 30 35.6 m		35.6 m	—	1.6 m	3,450 R²/f ²		
30	_	300	1.6 m	—	159 mm	3.83 R <sup>2</sup>		
300 – 1,500		159 mm	—	31.8 mm	0.0128 R <sup>2</sup> f			
1,500 – 100,000 31.8 mm – 0.5 mm 19.2R <sup>2</sup>								
Subscripts L and H are low and high; $\lambda$ 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  $\lambda/2\pi$ . The thresholds are



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based on the general population MPE limits with a single perfect reflection, outside of the reactive nearfield, 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*<sub>20cm</sub> in Formula (B.1) [repeated from \$2.1091(c)(1); also in \$1.1307(b)(1)(i)(B)].

$$P_{\rm th} (\rm mW) = ERP_{20 \,\rm cm} (\rm mW) = \begin{cases} 2040f & 0.3 \,\rm GHz \le f < 1.5 \,\rm GHz \\ 3060 & 1.5 \,\rm GHz \le f \le 6 \,\rm GHz \end{cases}$$
(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  $\lambda/4$  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) $R(\lambda/2\pi)(m)$ 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  $\lambda/4$ .

As for devices with antennas of length greater than  $\lambda/4$  where the gain is not well defined, but always less than that of a half-wave dipole (length  $\lambda/2$ ), 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.



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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 Pth (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*<sub>th</sub> is given by Formula (B.2).

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

where

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

and f is in GHz, d is the separation distance (cm), and ERP<sub>20cm</sub> 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					Distand	ce(mm)				
(MHz)	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)	Х	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				



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### 5 Measurement and Calculation

#### 5.1 Maximum transmit power

For BLE:

The Power Data is based on the RF Test Report SZCR230800253202. Antenna Gain: 1.5dBi

Output Power Into Antenna & RF Exposure Evaluation Distance:

Frequency	Maximum EIRP [dBm]	Maximum EIRP (mW)
2480	1.01	1.26

For 2.4G:

The Antenna Gain: 1.5dBi

Test Mode	Test Channel	Maximum Field Strength (dBuv/m)	E.I.R.P (dBm)	E.I.R.P (mW)
GFSK	2480Hz	89.47*	-5.69	0.27

(\*) Note:

The Maximum Field Strength is based on the RF Test Report SZCR230800253203.

Note: EIRP =  $pt \times gt = (E \times d)^2/30$  (According to ANSI C63.10 Annex G.1)

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)

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



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### 5.2 RF Exposure Calculation

For BLE:

The Max EIRP is 1.26mW.

**Remark**: we used the maximum power 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
$\boxtimes$	SAR-based Exemption( $P_{th}$ )	2.7mW	Yes

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

For 2.4G:

The Max EIRP is 0.27mW.

**Remark**: we used the maximum power 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( $P_{th}$ )	2.7mW	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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