

Test Report

Verified code: 113759

Report No.: E20221228512201-3

Customer: Shenzhen Bipu Technology Co., Ltd.

Address: Building 2, Floor 2, Wenkeng Industrial Area, Dafa Road No.24, Bantian, Long Gang District, Shenzhen, China

Sample Name: Mechanical Keyboard

Sample Model: PKKE221

Receive Sample Date: Dec.30,2022

Test Date: Jan.05,2023 ~ Jan.05,2023

Reference Document: CFR 47, FCC Part 2.1093 Radiofrequency radiation exposure evaluation: portable devices.

Test Result: Pass

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Approved by: Zhao Zetian

GRG METROLOGY & TEST GROUP CO., LTD.

Issued Date: 2023-05-12

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REPORT ISSUED HISTORY

Report Version	Report No.	Description	Compile Date
1.0	E20221228512201-3	Original Issue	2023-01-13

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1. GENERAL DESCRIPTION OF EUT

1.1. APPLICANT

Name: Shenzhen Bipu Technology Co., Ltd.
Address: Building 2, Floor 2, Wenkeng Industrial Area, Dafa Road No.24, Bantian, Long Gang District, Shenzhen, China

1.2. MANUFACTURER

Name: Shenzhen Bipu Technology Co., Ltd.
Address: Building 2, Floor 2, Wenkeng Industrial Area, Dafa Road No.24, Bantian, Long Gang District, Shenzhen, China

1.3. FACTORY

Name: Dongguan Jieguan Industrial Technology Co., Ltd.
Address: Room 301, No.1 Building, No.5, Xifa Road, Lin Village, Tangxia Town, Dongguan City, Guangdong Province.

1.4. BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Equipment: Mechanical Keyboard
Model No.: PKKE221
Adding Model: /
Trade Name: Keychron
FCC ID: 2ASF4-PKKE221
Power supply: DC 3.87V power supplied by battery
DC 5V power supplied by notebook
Name: Rechargeable Li-ion Polymer Battery
Model: BLP959
Battery Specification: Nominal Voltage: 3.87Vdc
Rated Capacity: 4880mAh/18.88Wh
Typical Capacity: 5000mAh/19.35Wh
Frequency Band: 2402MHz - 2480MHz
Transmit Power: GFSK: -3.04dBm
Modulation type: GFSK
Channel space: 1MHz
Antenna Specification: FPC antenna with 1.53dBi gain (Max.)
Temperature Range: -10°C ~ +50°C
Hardware Version: V2.6
Software Version: V1.02
Sample No: E20221228512201-0004
Note: /

2. LABORATORY

The tests & measurements refer to this report were performed by Shenzhen EMC Laboratory of GRG METROLOGY & TEST GROUP CO., LTD.

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3. LIMITS FOR GENERAL POPULATION/UNCONTROLLED EXPOSURE

Exposure category: General population/uncontrolled environment

EUT Type: Production Unit

Device Type: Portable Device

According to the KDB 447498 D04 Interim General RF Exposure Guidance v01:

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. 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 as below:

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

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 $ERP_{20 \text{ cm}}$ is per Formula (B.1). The example values shown in Table B.2 are for illustration only.

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

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

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4. ESTIMATION RESULT

4.1 MEASUREMENT RESULTS

Table 1 Antenna Specification

Mode	Antenna type	Internal Identification	Maximum antenna gain
DH5	FPC antenna	Antenna 1	1.53dBi

Table 2 Transmit Power

Mode	Maximum Output Power (dBm)	Antenna Gain (dBi)	E.i.r.p. (dBm)	Target power (dBm)	Tolerance (dB)	Maximum Tune-up Output power (dBm)
DH5	-3.04	1.53	-1.51	-1.0	±1.0	0

STANDALONE MPE

Mode	Frequency (MHz)	Maximum Tune-up Output power (dBm)	Maximum Tune-up Output power (mW)	Exemption Limit (mW)	Verdict
DH5	2480	0	1	2.72	PASS

Remark:

1. Threshold ERP(mW) = $(0.5/20)^{-\log(60/3060/\sqrt{f})} = (0.5/20)^{-\log(60/3060/\sqrt{2.48})} = 2.72\text{mW}$.

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5. CONCLUSION

The measurement results comply with the FCC Limit per 47 CFR 2.1093 for the uncontrolled RF Exposure of portable device.

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