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# RF Exposure Evaluation Report

**Report No.:** CQASZ20210100005EX-02  
**Applicant:** ShenZhen ZhongKeRui Electronics CO., LTD.  
**Address of Applicant:** 620, 6/F, TaiYangNeng GuiGu Building, Yunfeng road, Longhua, Shenzhen 518109, China  
**Equipment Under Test (EUT):**  
**EUT Name:** PR2400 bike headlight  
**Model No.:** PR2400, PR1800, PR2000, PR2600, PR3000, PR3500, PR4000  
**Test Model No.:** PR2400  
**Brand Name:** RAVEMEN  
**FCC ID:** 2AYUF-PR2N  
**Standards:** 47 CFR Part 1.1307  
47 CFR Part 1.1310  
KDB447498D01 General RF Exposure Guidance v06  
**Date of Receipt:** 2021-01-13  
**Date of Test:** 2021-01-13 to 2021-01-29  
**Date of Issue:** 2021-02-22  
**Test Result:** PASS\*

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

**Tested By:**

Jun Li

(Jun Li)

**Reviewed By:**

Ares Liu

(Ares Liu)

**Approved By:**

Sheek Luo

(Sheek Luo)



## 1 Version

### Revision History Of Report

| Report No.            | Version | Description    | Issue Date |
|-----------------------|---------|----------------|------------|
| CQASZ20210100005EX-02 | Rev.01  | Initial report | 2021-02-22 |

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### 3 General Information

#### 3.1 Client Information

|                          |   |
|--------------------------|---|
| Applicant:               | ShenZhen ZhongKeRui Electronics CO ., LTD.  |
| Address of Applicant:    | 620, 6/F, TaiYangNeng GuiGu Building, Yunfeng road, Longhua, Shenzhen 518109, China |
| Manufacturer:            | ShenZhen ZhongKeRui Electronics CO ., LTD.  |
| Address of Manufacturer: | 620, 6/F, TaiYangNeng GuiGu Building, Yunfeng road, Longhua, Shenzhen 518109, China |

#### 3.2 General Description of EUT

|                      |  |
|----------------------|--|
| Product Name:        | PR2400 bike headlight  |
| Model No.:           | PR2400, PR1800, PR2000, PR2600, PR3000, PR3500, PR4000   |
| Test Model No.:      | PR2400   |
| Trade Mark:          | RAVEMEN  |
| Hardware Version:    | V1.0   |
| Software Version:    | V1.21.2  |
| EUT Power Supply:    | 120V 60Hz  |
| Operation Frequency: | 2402MHz~2480MHz  |
| Modulation Type:     | GFSK   |
| Transfer Rate:       | 1Mbps(Test software see page 6)  |
| Number of Channel:   | 40   |
| Product Type:        | <input type="checkbox"/> Mobile <input type="checkbox"/> Portable <input checked="" type="checkbox"/> Fix Location |
| Antenna Type:        | PCB antenna  |
| Antenna Gain:        | 0dBi   |
| EUT Power Supply:    | Battery: DC 3.7V   |

Note:

Model No.: PR2400, PR1800, PR2000, PR2600, PR3000, PR3500, PR4000

Only the model PR2400 was tested, since the electrical circuit design, layout, components used and internal wiring were identical for the above models, with difference being color of appearance and model name.

## 4 SAR Evaluation

### 4.1 RF Exposure Compliance Requirement

#### 4.1.1 Limitst

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<br>(MHz)                                       | Electric field<br>strength<br>(V/m) | Magnetic field<br>strength<br>(A/m) | Power density<br>(mW/cm <sup>2</sup> ) | Averaging time<br>(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:  $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

$P_d$  = power density in mW/cm<sup>2</sup>

$P_{out}$  = 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

$P_d$  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.

#### 4.1.2 Test Procedure

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

### 1) For BLE

Antenna Gain: 0dBi

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 1.0 in linear scale.

Output Power Into Antenna & RF Exposure Evaluation Distance:

### Measurement Data

| GFSK mode        |                            |                            |                       |       |
|------------------|----------------------------|----------------------------|-----------------------|-------|
| Test channel     | Peak Output Power<br>(dBm) | Tune up tolerance<br>(dBm) | Maximum tune-up Power |       |
|                  |                            |                            | (dBm)                 | (mW)  |
| Lowest(2402MHz)  | 2.692                      | 2±1                        | 3.0                   | 1.995 |
| Middle(2440MHz)  | 2.530                      | 2±1                        | 3.0                   | 1.995 |
| Highest(2480MHz) | 2.418                      | 1.5±1                      | 2.5                   | 1.778 |

The worst case:

| Maximum tune-up Power<br>(mW) | Antenna Gain<br>(dBi) | Power Density<br>at R = 20 cm<br>(mW/cm <sup>2</sup> ) | Limit | Result |
|-------------------------------|-----------------------|--|-------|--------|
| 1.995                         | 0                     | 0.0004   | 1.0   | PASS   |

Note: 1) Refer to report No. CQASZ20210100005EX-01 for EUT test Max Conducted Peak Output Power value.

2)  $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot R^2) = (1.995 \cdot 1.0) / (4 \cdot 3.1416 \cdot 20^2) = 0.0004$

3) EUT's Bluetooth module is more than 20cm away from the human body.