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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:	☐ Mobile ☐ Portable ☒ 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 (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: $P_d = (P_{out} * G) / (4 * \pi * R^2)$

Where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 3.1416

R = distance between observation point and center of the radiator in cm

P_d is 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.

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 (dBm)	Tune up tolerance (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 (mW)	Antenna Gain (dBi)	Power Density at R = 20 cm (mW/cm²)	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.