Certificate # 2861.01



# Test Report

**Verified code:** 586437

**Report No.:** E202303101204-5

| | |
|---|---|
| Customer: | Anhui Ronds Science & Technology Incorporated Company |
| Address: | #59, branch road of biomedical park, high-tech district, Hefei, Anhui, China |
| Sample Name: | Wireless Data Collector |
| Sample Model: | RH570 |
| Receive Sample Date: | Mar.24,2023 |
| Test Date: | Mar.25,2023 ~ Jun.16,2023 |
| Reference Document: | CFR 47, FCC Part 2.1091Radiofrequency radiation exposure evaluation: mobile devices. |
| Test Result: | Pass |

Prepared by: Wen Wenwen Reviewed by: Wu Haoting Approved by: Xiao Liang

GRG METROLOGY & TEST GROUP CO., LTD.

Issued Date: 2023-06-25

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# Statement

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2. The sample information is provided by the client and responsible for its authenticity; The content of the report is only valid for the samples sent this time.

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5. Without the agreement of the laboratory, the client is not authorized to use the test results for unapproved propaganda.

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## REPORT ISSUED HISTORY

| Report Version | Report No. | Description | Compile Date |
|---|---|---|---|
| 1.0 | E202303101204-5 | Original Issue | 2023-06-16 |

**---------- The following blanks ----------**

# 1. GENERAL DESCRIPTION OF EUT

## 1.1 APPLICANT

| | |
|---|---|
| Name: | Anhui Ronds Science & Technology Incorporated Company |
| Address: | #59, branch road of biomedical park, high-tech district, Hefei, Anhui, China |

## 1.2 MANUFACTURER

| | |
|---|---|
| Name: | Anhui Ronds Science & Technology Incorporated Company |
| Address: | #59, branch road of biomedical park, high-tech district, Hefei, Anhui, China |

## 1.3 FACTORY

| | |
|---|---|
| Name: | Anhui Ronds Science & Technology Incorporated Company |
| Address: | #59, branch road of biomedical park, high-tech district, Hefei, Anhui, China |

## 1.4 BASIC DESCRIPTIONOF EQUIPMENTUNDER TEST

| | |
|---|---|
| Product Name: | Wireless Data Collector |
| Product Model: | RH570 |
| Adding Model: | / |
| Trade Name: | Ronds |
| FCC ID: | 2AKW5-RH570 |
| Power Supply: | 100~240VAC (50/60Hz) |
| Frequency Band: | 2.4G WiFi: 2412MHz - 2462MHz for 802.11b/g/n HT20<br>ZigBee: 2405MHz - 2475MHz<br>LoRa: 915MHz<br>LTE:<br>Band 2: Tx 1850MHz ~ 1910MHz, Rx 1930MHz ~ 1990MHz<br>Band 4: Tx 1710MHz ~ 1755MHz, Rx 2110MHz ~ 2155MHz<br>Band 5: Tx 824MHz ~ 849MHz, Rx 869MHz ~ 894MHz<br>Band 7: Tx 2500MHz ~ 2570MHz, Rx 2620MHz ~ 2690MHz<br>Band 12: Tx 699MHz ~ 716MHz, Rx 729MHz ~ 746MHz<br>Band 13: Tx 777MHz ~ 787MHz, Rx 746MHz ~ 756MHz<br>Band 25: Tx 1850MHz ~ 1915MHz, Rx 1930MHz ~ 1995MHz<br>Band 26(814-824MHz): Tx 814MHz ~ 824MHz, Rx 859MHz ~ 869MHz<br>Band 26(824-849MHz): Tx 824MHz ~ 849MHz, Rx 869MHz ~ 894MHz<br>Band 38: Tx 2570MHz ~ 2620MHz, Rx 2570MHz ~ 2620MHz<br>Band 41: Tx 2496MHz ~ 2690MHz, Rx 2496MHz ~ 2690MHz |
| Modulation type: | For 2.4G WiFi:<br>DSSS for 802.11b mode;<br>OFDM for 802.11g mode;<br>OFDM for 802.11n mode.<br>ZigBee: O-QPSK<br>LoRa: FSK<br>LTE: QPSK, 16QAM |

| | |
|---|---|
| Antenna Specification: | For 2.4G WiFi: External fixed antenna with 11dBi gain (Max)<br>ZigBee:<br>For module MG22-1: External fixed antenna with 5dBi gain (Max.),<br>For module MG22-2: External fixed antenna with 5dBi gain (Max.),<br>For module MG13: External fixed antenna with 5dBi gain (Max.)<br>LoRa: External fixed antenna, 6dBi(Max)<br>LTE: External fixed antenna<br>Band 2:5.00dBi(Max)<br>Band 4: 5.00dBi(Max)<br>Band 5: 3.00dBi(Max)<br>Band 7: 5.00dBi(Max)<br>Band 12: 3.00dBi(Max)<br>Band 13: 3.00dBi(Max)<br>Band 25: 5.00dBi(Max)<br>Band 26(814-824MHz): 3.00dBi(Max)<br>Band 26(824-849MHz): 3.00dBi(Max)<br>Band 38: 5.00dBi(Max)<br>Band 41: 5.00dBi(Max) |
| Temperature Range: | -40℃~+70℃ |
| Hardware Version: | RH570_FCC_HW_V1_01 |
| Software Version: | RH570_FCC_SW_V1_01 |
| Sample No: | E202303101204-0001, E202303101204-0003 |
| Note: | / |

**---------- The following blanks ----------**

## 2. LABORATORY

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


| | |
|---|---|
| Add.: | No.1301 Guanguang Road Xinlan Community, Guanlan Street, Longhua District Shenzhen, 518110, People's Republic of China. |
| P.C.: | 518110 |
| Tel : | 0755-61180008 |
| Fax: | 0755-61180008 |


### 2.1 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

| | |
|---|---|
| **USA** | A2LA(Certificate#:2861.01) |

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

| | |
|---|---|
| **Canada** | ISED (Company Number: 24897, CAB identifier:CN0069) |
| **USA** | FCC (Registration Number: 759402, Designation Number:CN1198) |

Copies of granted accreditation certificates are available for downloading from our web site, http://www.grgtest.com

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## 3. LIMITS FOR GENERAL POPULATION/UNCONTROLLED EXPOSURE

Exposure category: General population/uncontrolled environment
EUT Type: Production Unit
Device Type: Mobile Device

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.
In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.
In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0. The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

(B)Limits for General Population/Uncontrolled Exposure

| **Frequency Range (MHz)** | **Electric Field Strength (E) (V/m)** | **Magnetic Field Strength(H) (A/m)** | **Power Density (S) ($mW/cm^2$)** | **Averaging Time$[E]^2$, $[H]^2$ or S (minutes)** |
|---|---|---|---|---|
| 0.3-1.34 | 614 | 1.63 | (100)* | 30 |
| 1.34-30 | 824/f | 2.19/f | (180/f)* | 30 |
| 30-300 | 27.5 | 0.073 | 0.2 | 30 |
| 300-1500 | / | / | F/1500 | 30 |
| 1500-100,000 | / | / | 1.0 | 30 |

Note: f=frequency in MHz; *Plane-wave equivalent power density

## 4. CALCULATION METHOD

Predication of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01
$S=PG/4\pi R^2$
Where: S=power density
P=power input to antenna
G=power gain of the antenna in the direction of interest relative to anisotropic radiator
R=distance to the center of radiation of the antenna
From the EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the maximum gain of the used as following information, the RF power density can be obtained.

Table 1 Antenna Specification

| Mode | Antenna type | Internal Identification | Maximum antenna Gain (dBi) |
|---|---|---|---|
| 2.4G WiFi | External fixed antenna | Antenna 1 | 11 |
| ZigBee(MG22-1) | External fixed antenna | Antenna 2 | 5 |
| ZigBee(MG22-2) | External fixed antenna | Antenna 3 | 5 |
| ZigBee(MG13) | External fixed antenna | Antenna 4 | 5 |
| LoRa | External fixed antenna | Antenna 5 | 6 |
| FDD LTE Band 2 | External fixed antenna | Antenna 6 | 5 |
| FDD LTE Band 4 | | | 5 |
| FDD LTE Band 5 | | | 3 |
| FDD LTE Band 7 | | | 5 |
| FDD LTE Band 12 | | | 3 |
| FDD LTE Band 13 | | | 3 |
| FDD LTE Band 25 | | | 5 |
| FDD LTE Band 26 | | | 3 |
| TDD LTE Band 38 | | | 5 |
| TDD LTE Band 41 | | | 5 |

Table 2 Transmit Power

| Mode | Maximum Output Power (dBm) | Maximum Tune-up Output power (dBm) |
|---|---|---|
| 2.4G WiFi | 22.17 | 22.50 |
| ZigBee(MG22-1) | 2.24 | 2.50 |
| ZigBee(MG22-2) | 2.31 | 2.50 |
| ZigBee(MG13) | 1.85 | 2.00 |
| LoRa | 11.24 | 11.50 |
| FDD LTE Band 2 | / | 25.00 |
| FDD LTE Band 4 | / | 25.00 |
| FDD LTE Band 5 | / | 25.00 |
| FDD LTE Band 7 | / | 25.00 |
| FDD LTE Band 12 | / | 25.00 |
| FDD LTE Band 13 | / | 25.00 |
| FDD LTE Band 25 | / | 25.00 |
| FDD LTE Band 26 | / | 25.00 |
| TDD LTE Band 38 | / | 25.00 |
| TDD LTE Band 41 | / | 25.00 |

Note:The maximum output Power of LTE were refer to the module report. (Report NO.: HR/2019/1001601) which issued on 2019-02-28 by SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch.

For LoRa the maximum output power (EIRP)= E(dBμV/m)+20*log（D）-104.8 = 106.50+20*log(3) -104.8 = 11.24dBm, ERP=EIRP-2.15=11.24-2.15=9.09dBm.The LoRa maximum output power please refer to report

E202303101204-4, the 2.4G WiFi maximum output power please refer to report E202303101204-1, the ZigBee maximum output power please refer to report E202303101204-2.

## 5. ESTIMATION RESULT

### 5.1 MEASUREMENT RESULTS

**STANDALONE MPE**

| Mode | Frequency (MHz) | Tune-up Output power | | Maximum Antenna Gain (dBi) | Antenna Gain (linear) | MPE ($mW/cm^2$) | MPE Limits ($mW/cm^2$) |
|---|---|---|---|---|---|---|---|
| | | (dBm) | (mW) | | | | |
| 2.4G WiFi | 2412 - 2462 | 22.17 | 164.82 | 11 | 12.59 | 0.413 | 1.00 |
| ZigBee(MG22-1) | 2405 - 2475 | 2.24 | 1.67 | 5 | 3.16 | 0.001 | 1.00 |
| ZigBee(MG22-2) | 2405 - 2475 | 2.31 | 1.70 | 5 | 3.16 | 0.001 | 1.00 |
| ZigBee(MG13) | 2405 - 2475 | 1.85 | 1.53 | 5 | 3.16 | 0.001 | 1.00 |
| LoRa | 915 | 11.50 | 14.13 | 6 | 3.98 | 0.011 | 0.61 |
| FDD LTE Band 2 | 1850 - 1910 | 25 | 316.23 | 5 | 3.16 | 0.199 | 1.00 |
| FDD LTE Band 4 | 1710 -1755 | 25 | 316.23 | 5 | 3.16 | 0.199 | 1.00 |
| FDD LTE Band 5 | 824 - 849 | 25 | 316.23 | 3 | 2.00 | 0.126 | 0.55 |
| FDD LTE Band 7 | 2500 - 2570 | 25 | 316.23 | 5 | 3.16 | 0.199 | 1.00 |
| FDD LTE Band 12 | 699 - 716 | 25 | 316.23 | 3 | 2.00 | 0.126 | 0.47 |
| FDD LTE Band 13 | 777 - 787 | 25 | 316.23 | 3 | 2.00 | 0.126 | 0.52 |
| FDD LTE Band 25 | 1850 - 1915 | 25 | 316.23 | 5 | 3.16 | 0.199 | 1.00 |
| FDD LTE Band 26(814-824MHz) | 814-824 | 25 | 316.23 | 3 | 2.00 | 0.126 | 0.54 |
| FDD LTE Band 26(824-849MHz) | 824-849 | 25 | 316.23 | 3 | 2.00 | 0.126 | 0.55 |
| TDD LTE Band 38 | 2570 - 2620 | 25 | 316.23 | 5 | 3.16 | 0.199 | 1.00 |
| TDD LTE Band 41 | 2496 - 2690 | 25 | 316.23 | 5 | 3.16 | 0.199 | 1.00 |

Remark: MPE use distance is 20cm from manufacturer declaration of user manual.

For LTE and 2.4G Wifi, they can not work at the same time declared by applicant. So for simultaneously transmit result:

**Maximum Simultaneous transmission MPE Ratio for WWAN & ZigBee & LoRa:**

| Maximum MPE ratio (FDD LTE Band 12) | Maximum MPE ratio ZigBee(MG22-1) + ZigBee(MG22-2) + ZigBee(MG13) | Maximum MPE ratio (LoRa) | ∑ MPE ratios | Limit | Results |
|---|---|---|---|---|---|
| 0.268 | 0.003 | 0.018 | 0.289 | 1.000 | Pass |

Note: The estimation distance is 20cm. Maximum MPE ratio (FDD LTE Band 12)=0.126/0.47=0.268
Maximum MPE ratio ZigBee(MG22-1) =0.001/1.00=0.001, ZigBee(MG22-2)=0.001/1.00=0.001,

ZigBee(MG13)=0.001/1.00=0.001.
Maximum MPE ratio ZigBee(MG22-1) + ZigBee(MG22-2) + ZigBee(MG13)=0.001+0.001+0.001=0.003.

Maximum MPE ratio (LoRa)=0.011/0.61=0.018.
∑ MPE ratios= Maximum MPE ratio (FDD LTE Band 12) + Maximum MPE ratio ZigBee(MG22-1) + ZigBee(MG22-2) + ZigBee(MG13) + Maximum MPE ratio (LoRa)=0.268+0.003+0.018=0.289

**Maximum Simultaneous transmission MPE Ratio for 2.4G WiFi & ZigBee & LoRa:**

| Maximum MPE ratio (2.4G WiFi) | Maximum MPE ratio ZigBee(MG22-1) + ZigBee(MG22-2) + ZigBee(MG13) | Maximum MPE ratio (LoRa) | ∑ MPE ratios | Limit | Results |
|---|---|---|---|---|---|
| 0.413 | 0.003 | 0.018 | 0.434 | 1.000 | Pass |

Note: The estimation distance is 20cm. Maximum MPE ratio (2.4G WiFi) = 0.413/1.00=0.413, Maximum MPE ratio ZigBee(MG22-1) =0.001/1.00=0.001, ZigBee(MG22-2)=0.001/1.00=0.001, ZigBee (MG13) = 0.001/1.00 =0.001. Maximum MPE ratio ZigBee(MG22-1) + ZigBee(MG22-2) + ZigBee(MG13) = 0.001+ 0.001+ 0.001= 0.003. Maximum MPE ratio (LoRa)=0.011/0.61=0.018.
∑ MPE ratios= Maximum MPE ratio (2.4G WiFi) + Maximum MPE ratio ZigBee(MG22-1) + ZigBee(MG22-2) + ZigBee(MG13) + Maximum MPE ratio (LoRa)= 0.413 + 0.003 + 0.018=0.434.

## 6. CONCLUSION

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

**---------- End of Report ----------**