

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

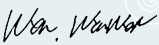
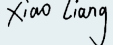
Receive Sample Date: Mar.24,2023

Test Date: Mar.25,2023 ~ Jun.16,2023

Reference Document: CFR 47, FCC Part 2.1091 Radiofrequency 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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REPORT ISSUED HISTORY

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

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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 DESCRIPTION OF EQUIPMENT UNDER TEST

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

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

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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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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)= $E(dB\mu V/m)+20*\log(D)-104.8=106.50+20*\log(3)-104.8=11.24dBm$, $ERP=EIRP-2.15=11.24-2.15=9.09dBm$. 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)	Σ 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.

$\sum$ 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)	$\sum$ 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.

$\sum$ 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 -----