Certificate # 2861.01

Test Report

Verified code: 043682

Report No.: E20230128179401-8

Customer:	Lumi United Technology Co., Ltd
Address:	B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen, China
Sample Name:	Door and Window Sensor P2
Sample Model:	DW-S02E
Receive Sample Date:	Jan.30,2023
Test Date:	Jan.31,2023 ~ Feb.21,2023
Reference Document:	CFR 47, FCC Part 2.1091 Radio frequency radiation exposure evaluation: mobile devices.
Test Result:	Pass

Prepared by: Chen XiaoCong Reviewed by: Jiang Tao Approved by: Zhao Zetian

GUANGZHOU GRG METROLOGY & TEST CO., LTD

Issued Date: 2023-03-08

GUANGZHOU GRG METROLOGY & TEST CO., LTD.
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Statement

1. The report is invalid without "special seal for inspection and testing"; some copies are invalid; The report is invalid if it is altered or missing; The report is invalid without the signature of the person who prepared, reviewed and approved it.

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.

3. When there are reports in both Chinese and English, the Chinese version will prevail when the language problems are inconsistent.

4. If there is any objection concerning the report, please inform us within 15 days from the date of receiving the report.

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	E20230128179401-8	Original Issue	2023-02-22

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1. GENERAL DESCRIPTION OF EUT

1.1 APPLICANT

Name:	Lumi United Technology Co., Ltd
Address:	B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen, China

1.2 MANUFACTURER

Name:	Lumi United Technology Co., Ltd
Address:	B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen, China

1.3 BASIC DESCRIPTIONOF EQUIPMENTUNDER TEST

Equipment:	Door and Window Sensor P2
Model No.:	DW-S02E
Adding Model:	DW-S02D
Models Difference:	DW-S02E&DW-S02D are the same on the board, schematic, hardware version, software version, structure and internal photos are same, only the model name is different.
Trade Name:	Aqara
FCC ID:	2AKIT-DW-S02
Power supply:	DC 3V power supplied by battery
Frequency Band:	2402MHz-2480MHz for BLE, 2405MHz-2480MHz for Thread
Transmit Power:	BLE for 1Mbps:8.35dBm, BLE for 2Mbps:8.35dBm, Thread: 7.66dBm
Modulation type:	GFSK for BLE, O-QPSK for Thread
Antenna Specification:	BLE&Thread:PIFA antenna with 1dBi gain (Max)
Temperature Range:	-10 ℃ ~ 50 ℃
Hardware Version:	X0
Software Version:	0.0.0.1
Sample No:	E20230128179401-0002, E20230128179401-0005
Note:	All the tests were performed on the model DW-S02E.

2. LABORATORY AND ACCREDITATIONS

2.1 LABORATORY

The tests & measurements refer to this report were performed by Shenzhen EMC Laboratory of Guangzhou GRG Metrology & Test Co., Ltd.

Add.:	No.1301 Guanguang Road Xinlan Community, Guanlan Street, Longhua District Shenzhen, 518110, People's Republic of China.
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2.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to GB/T 27025(ISO/IEC 17025:2017)

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/UNCONTROLLEDEXPOSURE

General

According to the KDB 447498 D04 Interim General RF Exposure Guidance v01,General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table 4.1 to support an exemption from further evaluation from 300 kHz through 100 GHz.

TABLE 4.1—THRESHOLDS FOR SINGLE RF SOURCES SUBJECT TO ROUTINE ENVIRONMENTAL EVALUATION

RF Source Frequency			**Minimum Distance**			**Threshold ERP**
f_L MHz		f_H MHz	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W
0.3	–	1.34	159 m	–	35.6 m	1,920 R^2
1.34	–	30	35.6 m	–	1.6 m	3,450 R^2/f^2
30	–	300	1.6 m	–	159 mm	3.83 R^2
300	–	1,500	159 mm	–	31.8 mm	0.0128 R^2f
1,500	–	100,000	31.8 mm	–	0.5 mm	19.2R^2
Subscripts L and H are low and high; λ is wavelength. From § 1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.						

For mobile devices that are not exempt per Table 4.1 at distances from 20 cm to 40 cm and in 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in §1.1310 is necessary if the ERP of the device is greater than ERP_{20cm} in Formula (4.1).

Formula (4.1):

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

4. CALCULATION METHOD

Predication of MPE limit at a given distance

EIRP(dBm)=Maximum Tune-up Output power (dBm)+Maximum antenna gain(dBi)

ERP(dBm)=EIRP(dBm)-2.15

R=minimum distance to the center of radiation of the antenna

From the EUT RF output power, the minimum mobile separation distance, d=20cm, as well as the maximum gain of the used as following information, the RF power ERP can be obtained.

Table 1 Antenna Specification

Mode	Antenna type	Internal Identification	Maximum antenna gain
BLE 1M	PIFA antenna	Antenna 1	1dBi
BLE 2M	PIFA antenna	Antenna 1	1dBi
Thread	PIFA antenna	Antenna 1	1dBi

Table 2 Transmit Power

Mode	Maximum Output Power (dBm)	Maximum Tune-upOutput power (dBm)
BLE 1M	8.35	8.00±1.00
BLE 2M	8.35	8.00±1.00
Thread	7.66	7.00±1.00

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5. ESTIMATION RESULT

5.1 MEASUREMENT RESULTS

STANDALONE MPE

Mode	Frequency (MHz)	Tune-up Output power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	ERP (dBm)	ERP (W)	Threshold ERP(W)
BLE 1M	2402- 2480	9.00	1.00	10.00	7.85	0.006	0.768
BLE 2M	2402- 2480	9.00	1.00	10.00	7.85	0.006	0.768
Thread	2405-0475	8.00	1.00	9.00	6.85	0.005	0.768

Remark:

1. RF Exposure use distance is 20cm from manufacturer declaration of user manual.
2. Threshold ERP(W)= 19.2R ²(W)=19.2*0.2*0.2(W)=0.768(W).
3. The BLE and Thread do not support simultaneous transmission
4. ERP(dBm)=EIRP(dBm)-2.15

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6. CONCLUSION

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

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