Certificate # 2861.01

Test Report

Verified code: 239580

Report No.: E20230117700901-5

Customer:	Lumi United Technology Co., Ltd.
Address:	B1,Chongwe Park,Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen, China.
Sample Name:	Smart Lock U100
Sample Model:	SDL-D01
Receive Sample Date:	Jan.18,2023
Test Date:	Jan.30,2023 ~ Feb.17,2023
Reference Document:	CFR 47, FCC Part 2.1091Radiofrequency radiation exposure evaluation: mobile devices.
Test Result:	Pass

Prepared by: Chen XiaoCong Reviewed by: Wu Haoting Approved by: Zhao Zetian

GUANGZHOU GRG METROLOGY & TEST CO., LTD

Issued Date: 2023-03-03

GUANGZHOU GRG METROLOGY & TEST CO., LTD.
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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	E20230117700901-5	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,Chongwe Park,Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen, China.

1.2 MANUFACTURER

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

1.3 BASIC DESCRIPTIONOF EQUIPMENTUNDER TEST

Equipment:	Smart Lock U100
Model No.:	SDL-D01
Adding Model:	DL-D01D
Models Difference:	That EUT (Smart Lock U100) Model Numbers SDL-D01 and DL-D01D have the same technical construction including circuit diagram PCB layout, hardware version and software version identical, except sales area, packaging and accessories are different, and all the tests were performed on the model SDL-D01.
Trade Name:	Aqara
FCC ID:	2AKIT-SDLD01
Power supply:	DC 6V power supplied by 4 AA batteries,DC 5V power supplied by USB-C emergency port
Frequency Band:	2402MHz-2480MHz for BLE, 2405MHz-2475MHz for Zigbee,13.65MHz for NFC
Maximum Transmit Power:	BLE for 1Mbps:7.75dBm, BLE for 2Mbps:7.75dBm, Zigbee: 7.71dBm,NFC:-47.90dBm
Modulation type:	GFSK for BLE, O-QPSK for Zigbee
Antenna Specification:	BLE&Zigbee: FPC antenna with 2dBi gain (Max) NFC:PCB antenna with 2dBi gain(Max)
Temperature Range:	-35 ℃~66 ℃
Hardware Version:	V2.1
Software Version:	1.0.4_0007
Sample No:	E20230117700901-0003, E20230117700901-0004，E20230117700901-0007
Note:	/

2. LABORATORY

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

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3.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

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).

$$P_{th}\ (\text{mW}) = ERP_{20\ cm}\ (\text{mW}) = \begin{cases} 2040f & 0.3\ \text{GHz} \le f < 1.5\ \text{GHz} \\ 3060 & 1.5\ \text{GHz} \le f \le 6\ \text{GHz} \end{cases} \quad (4,1)$$

In accordance with KDB447498D04 Either SAR-based or MPE-based exemption may be considered for test exemption for fixed, mobile, or portable device exposure conditions; therefore, the contributions from each exemption in conjunction with the measured SAR ($Evaluated_k$ term) shall be used to determine exemption for simultaneous transmission according to Formula

$$\text{MPE Ratio} = \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} < 1$$

ERP_j: the available maximum time-averaged power or the ERP, whichever is greater, of fixed, mobile, or portable RF source j.

$ERP_{th,j}$: exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least $\lambda/2\pi$, according to the applicable § 1.1307(b)(3)(i)(C) Table 1 formula at the location in question.

the sum of the ratios of the applicable terms for SAR-based, MPE-based and measured SAR or MPE shall be less than 1, to determine simultaneous transmission exposure compliance

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	FPC antenna	Antenna 1	2dBi
BLE 2M	FPC antenna	Antenna 1	2dBi
Zigbee	FPC antenna	Antenna 1	2dBi
NFC	PCB antenna	Antenna 2	2dBi

Table 2 Transmit Power

Mode	Maximum Output Power (dBm)	Tune-up Output Power (dBm)
BLE 1M	7.75	8.00±1
BLE 2M	7.75	8.00±1
Zigbee	7.71	8.00±1

Mode	Maximum EIRP (dBm)	Tune-up EIRP (dBm)
NFC	-36.07	-36.00±1

Remark:

1) NFC Maximum EIRP(dBm) =NFC maximum output electric field intensity(dBuV/m)+20log(d)-104.7=59.09dBuV/m +20log(3m)– 104.7= -36.07dBm

5. ESTIMATION RESULT

5.1 MEASUREMENT RESULTS

STANDALONE MPE

Mode	Frequency (MHz)	Maximum Tune-up Output power (dBm)	Antenna Gain (dBi)	Maximum Tune-up EIRP (dBm)	Maximum Tune-up ERP (dBm)	Maximum Tune-up ERP (W)	Threshold ERP (W)
BLE 1M	2402- 2480	9.00	2	11.00	8.85	0.008	0.768
BLE 2M	2402- 2480	9.00	2	11.00	8.85	0.008	0.768
Zigbee	2405-0475	9.00	2	11.00	8.85	0.008	0.768

Mode	Frequency (MHz)	Maximum Tune-up EIRP (dBm)	Maximum Tune-up ERP (dBm)	Maximum Tune-up ERP (W)	Threshold ERP (W)
NFC	13. 56	-35.00	-37.15	0.00000019	0.751

Remark:

1) RF Exposure use distance is 20cm from manufacturer declaration of user manual.

2) 1.34 MHz<f≤30MHz Threshold ERP(W)= 3450R / f^2(W)=3450*0.2*0.2/(13.56*13.56)(W)=0.751(W),

1500 MHz<f≤100GHz Threshold ERP(W)= 19.2R ^{2}(W)=19.2*0.2*0.2(W)=0.768(W) (where f is in MHz).

3) ERP(dBm)= EIRP(dBm)-2.15

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Maximum Simultaneous transmission MPE ratio for BLE and NFC

Maximum MPE ratio Zigbee	Maximum MPE ratio NFC	∑ MPE ratios	Limit	Results
0.01040000	0.00000025	0.01040025	1.00000	Pass

Note:

1. The BLE and zigbee do not support simultaneous transmission,the BLE and NFC do not support simultaneous transmission,the zigbee and NFC support simultaneous.
2. ERP_j: the available maximum time-averaged power or the ERP, whichever is greater, of fixed, mobile, or portable RF source j.
3. $ERP_{th,j}$: exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least $\lambda/2\pi$, according to the applicable §1.1307(b)(3)(i)(C) Table 1 formula at the location in question.
4. Maximum MPE Ratio (Zigbee) =Maximum Tune-up ERP/ Threshold ERP=0.008W/0.768W=0.0104;
   Maximum MPE Ratio (NFC) = Maximum Tune-up ERP/ Threshold ERP =0.00000019W/0.751W=0.00000025;
   ∑ MPE ratios= Maximum MPE Ratio (Zigbee)+ Maximum MPE Ratio (NFC)=0.0104+0.00000025=0.01040025

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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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