Certificate # 2861.01

Test Report

Verified code: 938862

Report No.: E20240129370001-11

Customer:	Lumi United Technology Co., Ltd
Address:	B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen, China
Sample Name:	Aqara Keypad
Sample Model:	KP-X01D
Receive Sample Date:	Feb.01,2024
Test Date:	Feb.02,2024 ~ Apr.25,2024
Reference Document:	47 CFR, FCC Part 2.1091 Radio frequency radiation exposure evaluation: mobile devices
Test Result:	Pass

Prepared by: Chen Xiaocong Chen Xiaocong

Reviewed by: Jiang Tao Jiang Tao

Approved by: Xiao Liang Xiao Liang

GRG METROLOGY & TEST GROUP CO., LTD.

Issued Date: 2024-04-26

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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.

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	E20240129370001-11	Original Issue	2024-04-25

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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:	Aqara Keypad
Model No.:	KP-X01D
Adding Model:	/
Models Difference:	/
Trade Name:	Aqara
FCC ID:	2AKIT-KPX01D
Power supply:	4 LR3 AAA 1.5V Batteries(DC 6V) DC 12-24V,0.5A AC 12-24V,0.5A
Frequency Band:	2402MHz - 2480MHz for Bluetooth LE with 1M&2M, 13.56MHz for NFC
Transmit Power:	BLE for 1Mbps: 8.52dBm, BLE for 2Mbps: 8.56dBm,
Modulation type:	GFSK for BLE ASK for NFC
Antenna Specification:	Antenna 1: PIFA antenna 0.82dBi gain (Max) Antenna 2: Coil antenna 1dBi gain(Max)
Temperature Range:	-15 ℃ ~ 66 ℃
Hardware Version:	V2.1
Software Version:	V0019
Sample No:	E20240129370001-0010, E20240129370001-0015
Note 1:	The EUT antenna gain is provided by the applicant. This report is made solely on the basis of such data and/or information. We accept no responsibility for the authenticity and completeness of the above data and information and the validity of the results and/or conclusions.

2. LABORATORY

2.1 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

2.2 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	0.82dBi
BLE 2M	PIFA antenna	Antenna 1	0.82dBi
NFC	Coil antenna	Antenna 2	1.00dBi

Table 2 Transmit Power

Mode	Maximum Output Power (dBm)	Maximum Tune-upOutput power (dBm)
BLE 1M	8.52	8.00±1.00
BLE 2M	8.56	8.00±1.00

Mode	Maximum EIRP (dBm)	Tune-up EIRP (dBm)
NFC	-30.11	-30.00±1

Remark:

1) NFC Maximum EIRP(dBm) =NFC maximum output electric field intensity(dBuV/m)+20log(d)-104.7=65.05dBuV/m +20log(3m)– 104.7= -30.11dBm

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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)	ERP (dBm)	Maximum Tune-up ERP (W)	Threshold ERP(W)
BLE 1M	2402- 2480	9.00	0.82	9.82	7.67	0.00585	0.768
BLE 2M	2402- 2480	9.00	0.82	9.82	7.67	0.00585	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	-29.00	-31.15	0.00000077	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 BLE	Maximum MPE ratio NFC	∑ MPE ratios	Limit	Results
0.0076	0.00000103	0.00760103	1.00000	Pass

Note:

1. ERP_j: the available maximum time-averaged power or the ERP, whichever is greater, of fixed, mobile, or portable RF source j.
2. $ERP_{th,j}$: 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.
3. Maximum MPE Ratio (BLE) =Maximum Tune-up ERP/ Threshold ERP=0.00585W/0.768W=0.0076;
   Maximum MPE Ratio (NFC) = Maximum Tune-up ERP/ Threshold ERP
   =0.00000077W/0.751W=0.00000103;
   ∑ MPE ratios= Maximum MPE Ratio (Zigbee)+ Maximum MPE Ratio (NFC)=0.0076+0.00000103=0.00760103

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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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