Test Report

Verified code: 256978

Report No.: E20240407651301-6

Customer:	Lumi United Technology Co., Ltd
Address:	B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen, China
Sample Name:	Presence Sensor FP1E
Sample Model:	PS-S03D
Receive Sample Date:	Apr.08,2024
Test Date:	Apr.09,2024 ~ Apr.19,2024
Reference Document:	47 CFR, FCC Part 2.1091 Radio frequency radiation exposure evaluation: mobile devices
Test Result:	Pass

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Reviewed by: Wu Haoting — Wu Haoting

Approved by: Xiao Liang — Xiao Liang

GRG METROLOGY & TEST GROUP CO., LTD.

Issued Date: 2024-05-15

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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	E20240407651301-6	Original Issue	2024-05-11

Note:

1). The maximum output power of radar were refer to the report 2402S47547-RF-00B which issued on 11-05-2024 by Bay Area Compliance Laboratories Corp. (Dongguan).

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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:	Presence Sensor FP1E
Model No.:	PS-S03D
Adding Model:	PS-S03E
Models Difference:	PS-S03D and PS-S03E have the same technical construction including circuit diagram, PCB LAYOUT, hardware version and software version identical, except sales area and packaging are different.
Trade Name:	Aqara
FCC ID:	2AKIT-PSS03
Power supply:	DC 5V, 1A
Frequency Band:	ZigBee: 2405MHz-2480MHz Radar: 60000MHz-61500MHz
Transmit Power:	ZigBee:7.34dBm Radar: 9.62dBm
Modulation type:	ZigBee:O-QPSK Radar: FMCW
Antenna Specification:	ZigBee:PIFA antenna 2.0dBi gain (Max.) Radar: Integrated in chip antenna with 5.0dBi gain (Max)
Temperature Range:	-10 ℃ ~ +40 ℃
Hardware Version:	T1
Software Version:	V.1
Sample No:	E20240407651301-0001, E20240407651301-0002, E20240407651301-0003
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.
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Tel :	0755-61180008
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2.2 ACCREDITATIONS

Our laboratories are accredited and approved by the following approval agencies according to GB/T 27025

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 MHz			**Minimum Distance**			**Threshold ERP**
f_LMHz		f_HMHz	$\lambda_L/2\pi$		$\lambda_H/2\pi$	W
0.3	-	1.34	159m	-	35.6m	$1920R^2$
1.34	-	30	35.6m	-	1.6m	$3450R^2/f^2$
30	-	300	1.6m	-	159m	$3.83R^2$
300	-	1500	159mm	-	31.8mm	$0.0128R^2 f$
1500	-	100000	31.8mm	-	0.5mm	$192R^2$
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):

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

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

$$\text{MPE Ratio} = \sum_{j=1}^{b} \frac{\text{ERP}_j}{\text{ERP}_{th,j}} < 1$$

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
ZigBee	PIFA antenna	Antenna 1	2.0dBi
Radar	Integrated in chip antenna	Antenna 2	5.0dBi

Table 2 Transmit Power

Mode	Maximum Output Power (dBm)	Maximum Tune-up Output power (dBm)
ZigBee	7.34	5.50±2.00
Radar	9.62	9.00±1.00

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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)
ZigBee	2405- 2480	7.50	2.0	9.50	7.35	0.0054	0.768
Radar	60000-61500	10.00	5.0	15.00	12.85	0.0193	0.768

Remark:

1) RF Exposure use distance is 20cm from manufacturer declaration of user manual.
2) 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

Maximum Simultaneous transmission MPE Ratio for WLAN and Radar

Maximum MPE ratio ZigBee	Maximum MPE ratio Radar	∑ MPE ratios	Limit	Results
0.0070	0.0251	0.0321	1.0000	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 λ/2π, according to the applicable §1.1307(b)(3)(i)(C) Table 1 formula at the location in question.
3. Maximum MPE Ratio (ZigBee) =Maximum Tune-up ERP/ Threshold ERP=0.0054W/0.768W=0.0070;
   Maximum MPE Ratio (Radar) = Maximum Tune-up ERP/ Threshold ERP =0.0193W/0.768W=0.0251;
   ∑ MPE ratios= Maximum MPE Ratio (ZigBee)+ Maximum MPE Ratio (Radar)=0.0070+0.0251=0.0321

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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