

Test Report

Verified code: 826245

Report No.: E20230828994601-8

Customer: Lumi United Technology Co., Ltd

Address: B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen, China

Sample Name: Motion and Light Sensor P2

Sample Model: ML-S03D

Receive Sample Date: Aug.28,2023

Test Date: Aug.30,2023 ~ Sep.05,2023

Reference Document: 47 CFR, FCC Part 2.1091 Radio frequency radiation exposure evaluation: mobile devices

Test Result: Pass

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GRG METROLOGY & TEST GROUP CO., LTD.

Issued Date: 2023-11-21

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REPORT ISSUED HISTORY

Report Version	Report No.	Description	Compile Date
1.0	E20230828994601-8	Original Issue	2023-11-02

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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 DESCRIPTION OF EQUIPMENT UNDER TEST

Equipment: Motion and Light Sensor P2

Model No.: ML-S03D

Adding Model: ML-S03E

Models Difference: ML-S03E & ML-S03D 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-MLS03

Power supply: DC 3V power supplied by battery

Frequency Band: 2402MHz-2480MHz for BLE, 2405MHz-2480MHz for Thread

Transmit Power: BLE for 1Mbps:9.82dBm, BLE for 2Mbps:9.81dBm, Thread: 8.26dBm

Modulation type: GFSK for BLE, O-QPSK for Thread

Antenna Specification: BLE&Thread:PIFA antenna with 0.95dBi gain (Max)

Temperature Range: -10 °C ~ 55 °C

Hardware Version: X3

Software Version: 0.0.0.1

Sample No: E20230828994601-0001, E20230828994601-0002

Note 1: 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.

Note 2: All the tests were performed on the model ML-S03D.

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.

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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,

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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 ² f
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 $ERP_{20\text{cm}}$ in Formula (4.1).

Formula (4.1):

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

4. CALCULATION METHOD

Predication of MPE limit at a given distance

$$EIRP(\text{dBm}) = \text{Maximum Tune-up Output power (dBm)} + \text{Maximum antenna gain(dBi)}$$

$$ERP(\text{dBm}) = EIRP(\text{dBm}) - 2.15$$

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

From the EUT RF output power, the minimum mobile separation distance, $d=20\text{cm}$, 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	0.95dBi
BLE 2M	PIFA antenna	Antenna 1	0.95dBi
Thread	PIFA antenna	Antenna 1	0.95dBi

Table 2 Transmit Power

Mode	Maximum Output Power (dBm)	Maximum Tune-up Output power (dBm)
BLE 1M	9.82	9.00 ± 1.00
BLE 2M	9.81	9.00 ± 1.00
Thread	8.26	8.00 ± 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	10.00	0.95	10.95	8.80	0.008	0.768
BLE 2M	2402- 2480	10.00	0.95	10.95	8.80	0.008	0.768
Thread	2405-0475	9.00	0.95	9.95	7.80	0.006	0.768

Remark:

1. RF Exposure use distance is 20cm from manufacturer declaration of user manual.
2. Threshold $ERP(W) = 19.2R^{-2}(W) = 19.2 * 0.2^2(W) = 0.768(W)$.
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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