Test Report

Verified code: 148941

Report No.: E20241111636501-12EN

Customer:	Lumi United Technology Co., Ltd
Address:	B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen
Sample Name:	Climate Sensor W100
Sample Model:	TH-S04E
Receive Sample Date:	Nov.12,2024
Test Date:	Nov.15,2024 ~ Nov.29,2024
Reference Document:	47 CFR 2.1091 Radio frequency radiation exposure evaluation: mobile devices.
Test Result:	Pass

Prepared by: Huang Lifang Reviewed by: Jiang Tao Approved by: Xiao Liang

GRG METROLOGY & TEST GROUP CO., LTD

Issued Date: 2024-12-16

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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. This testing report is only for scientific research, teaching, internal quality control, etc.

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REPORT ISSUED HISTORY

Report Version	Report No.	Description	Compile Date
1.0	E20241111636501-12EN	Original Issue	2024-12-06

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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

1.2 MANUFACTURER

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

1.3 BASIC DESCRIPTIONOF EQUIPMENTUNDER TEST

Equipment:	Climate Sensor W100
Model No.:	TH-S04E
Adding Model:	TH-S04D
Models Difference:	The model No.TH-S04E & TH-S04D have the same technical construction including circuitdiagram,PCB LAYOUT, hardware version and software version identical, except sales area and packaging are different.
Trade Name:	Aqara
FCC ID:	2AKIT-THS04
Power supply:	DC 3V
Battery Specification:	Button batteries; Model: CR2450; Nominal Voltage: 3V.
Frequency Band:	2402MHz-2480MHz for BLE 1M & 2M; 2405MHz-2480MHz for Zigbee & Thraed.
Maximum Transmit Power:	7.37dBm for BLE 1M; 7.36dBm for BLE 2M; 7.36dBm for Zigbee; 7.37dBm for Thraed.
Modulation type:	GFSK for BLE 1M & 2M; O-QPSK for Zigbee & Thraed.
Antenna Specification:	PCB antenna with 1dBi gain (Max.)
Temperature Range:	-20℃ ~ +60℃
Hardware Version:	V12
Software Version:	V0.0.2.0

Sample No:	E20241111636501-0002
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. Based on the differences in models, the model TH-S04E was recorded in this report.

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2. LABORATORY & ACCREDITATIONS

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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2.2 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

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.

3.1 MEASUREMENT RESULTS

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	Frequency Band	Antenna type	Internal Identification	Maximum antenna gain (dBi)
BLE	2402-2480	PCB antenna	Antenna 1	1dBi
Zigbee	2405-2480	PCB antenna	Antenna 1	1dBi
Thread	2405-2480	PCB antenna	Antenna 1	1dBi

Table 2 Transmit Power for ERP & Maximum Conducted Output Power

Mode	Maximum Conducted output peak Power (dBm)	Target Maximum Conducted Output peak Power (dBm)	Tolerance (dB)	Maximum Tune-up Maximum Conducted Output peak Power (dBm)	Maximum Tune-up ERP (dBm)
BLE-1M	7.37	8	±1	9	7.85
BLE-2M	7.36	8	±1	9	7.85
Zigbee	7.36	8	±1	9	7.85
Thread	7.37	8	±1	9	7.85

Note:

1) The maximum output Power of BLE were refer to the module report.
2) Maximum Tune-up ERP of PCB antenna = Maximum Tune-up Maximum Conducted Output peak Power + antenna gain -2.15= 9+1-2.15= 7.85 dBm

STANDALONE MPE

Mode	Antenna type	Frequency (MHz)	Maximum Tune-up ERP (dBm)	Maximum Tune-up ERP (mW)	Threshold ERP (mW)	Verdict
BLE-1M	PCB antenna	2480	7.85	6.10	768	PASS
BLE-2M	PCB antenna	2480	7.85	6.10	768	PASS
Zigbee	PCB antenna	2480	7.85	6.10	768	PASS
Thread	PCB antenna	2480	7.85	6.10	768	PASS

Remark:

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

b.Threshold ERP(W)= 19.2R ²(W)=19.2*0.2*0.2(W)=0.7680(W)=768(mW).

c. The BLE, Zigbee and Thread can’t transmit simultaneously.

4. 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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