Test Report

Verified code: 155148

Report No.: E20230411918001-2

Customer:	Lumi United Technology Co., Ltd
Address:	B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen, China
Sample Name:	Dual Relay Module T2
Sample Model:	DCM-K01
Receive Sample Date:	Apr.17,2023
Test Date:	Apr.20,2023 ~ May.10,2023
Reference Document:	CFR 47, FCC Part 2.1091Radio frequency radiation exposure evaluation: mobile devices.
Test Result:	Pass

Prepared by: Chen Xiaocong Reviewed by: Jiang Tao Approved by: Xiao Liang

GRG METROLOGY & TEST GROUP CO., LTD.

Issued Date: 2023-05-29

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Statement

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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	E20230411918001-2	Original Issue	2023/05/18

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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:	Dual Relay Module T2
Model No.:	DCM-K01
Adding Model:	/
Model Differences:	/
Trade Name:	Aqara
FCC ID:	2AKIT-DCM-K01
Power Supply:	AC 100-250V, 50/60Hz, Max. 10A,Max 2500W; DC 24-30V, Max. 10A, Max 300W; DC 30-60V, Max. 1A, Max 60W
Adapter Specification:	/
Frequency Range	2405MHz-2475MHz
Transmit Power:	6.68dBm
Modulation type:	O-QPSK
Antenna Specification:	PIFA antenna 1dBi gain (Max.)
Temperature Range:	-10 ℃ ~+40 ℃
Hardware Version:	x4
Software Version:	0.0.0_0023
Sample No:	E20230411918001-0002
Note:	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 AND 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. EVALUATION METHOD

Exposure category: General population/uncontrolled environment
EUT Type: Production Unit
Device Type: Mobile Device
Refer Standard: KDB 447498 D04 Interim General RF Exposure Guidance v01
FCC Part 2 §2.1091

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.
In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.
In accordance with KDB 447498 D04 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0. The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

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4. LIMITS FOR GENERAL POPULATION/UNCONTROLLEDEXPOSURE

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):

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

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5. 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	1.0dBi

Table 2 Transmit Power

Mode	Maximum Output Power (dBm)	Maximum Tune-upOutput power (dBm)
Zigbee	6.68	7.00±1.00

Note:
The maximum output Power of Zigbee were refer to Report No.: E20230411918001-1.

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6. ESTIMATION RESULT

6.1 CONDUCTED POWER RESULTS

STANDALONE MPE

Mode	Frequency (MHz)	Tune-up Output power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	ERP (dBm)	ERP (W)	Threshold ERP(W)
Zigbee	2402- 2475	8.00	1.00	9.00	6.85	0.005	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*0.2(W)=0.768(W).
3. ERP(dBm)=EIRP(dBm)-2.15

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7. 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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