Certificate # 2861.01

# TEST REPORT

Verified Code: 523144

| | | | |
|---|---|---|---|
| **Report No.:** | E20210414049301-6 | **Application No.:** | E20210414049301 |
| **Client:** | Lumi United Technology Co., Ltd | | |
| **Address:** | 8th Floor, JinQi Wisdom Valley, No.1 Tangling Road, Liuxian Ave, Taoyuan Residential District, Nanshan District, Shenzhen.China | | |
| **Sample Description:** | Hub E1 | | |
| **Model:** | HE1-G01 | | |
| **Test Specification:** | CFR 47, FCC Part 2.1091 | | |
| **Receipt Date:** | 2021-04-20 | | |
| **Test Date:** | 2021-06-18 to 2021-07-14 | | |
| **Issue Date:** | 2021-07-27 | | |
| **Test Result:** | Pass | | |

| **Prepared By:** | **Reviewed By:** | **Approved By:** |
|---|---|---|
| Test Engineer | Technical Manager | Manager |
| Yu Shanshan. | Jiang Tao | GUANGZHOU GRG METROLOGY & TEST CO.,LTD. APPROVED(03) |

**Other Aspects:**

Note:Note

**Abbreviations:** *ok / P = passed; fail / F = failed; n.a. / N = not applicable;*

**The test result in this test report refers exclusively to the presented test sample. This report shall not be reproduced except in full, without the written approval of GRGT.**

# DIRECTIONS OF TEST

1. **This station carries out test task according to the national regulation of verification which can be traced to National Primary Standards and BIPM.**

2. **The test report merely corresponds to the test sample. It is not permitted to copy extracts of these test result without the written permission of the test laboratory.**

3. **If there is any objection concerning the test, the client should inform the laboratory within 15 days from the date of receiving the test report.**

## TABLE OF CONTENTS

# 1. GENERAL DESCRIPTION OF EUT

## 1.1. APPLICANT

| | |
|---|---|
| Name: | Lumi United Technology Co., Ltd |
| Address: | 8th Floor, JinQi Wisdom Valley, No.1 Tangling Road, Liuxian Ave, Taoyuan Residential District, Nanshan District, Shenzhen.China |

## 1.2. MANUFACTURER

| | |
|---|---|
| Name: | Lumi United Technology Co., Ltd |
| Address: | 8th Floor, JinQi Wisdom Valley, No.1 Tangling Road, Liuxian Ave, Taoyuan Residential District, Nanshan District, Shenzhen.China |

## 1.3. FACTORY

| | |
|---|---|
| Name: | Lumi United Technology Co., Ltd |
| Address: | 8th Floor, JinQi Wisdom Valley, No.1 Tangling Road, Liuxian Ave, Taoyuan Residential District, Nanshan District, Shenzhen.China |

## 1.4. BASIC DESCRIPTIONOF EQUIPMENTUNDER TEST

| | |
|---|---|
| Equipment: | Hub E1 |
| Model No.: | HE1-G01 |
| Adding Model: | / |
| Trade Name: | Aqara |
| FCC ID: | 2AKIT-HE1G01 |
| Power supply: | Input: 5V ⎓, 0.5A |
| Frequency Range: | ZigBee: 2405~2475MHz<br>2.4G WiFi: 2412~2462MHz |
| Transmit Power: | ZigBee: 8.73dBm<br>2.4G WiFi:<br>18.96dBm for 802.11b mode<br>24.62dBm for 802.11g mode<br>24.39dBm for 802.11n HT20 mode<br>23.28dBm for 802.11n HT40 mode |
| Modulation type: | ZigBee: OQPSK<br>2.4G WiFi: DSSS, OFDM |
| Channel space: | 5MHz |
| Antenna Specification: | ZigBee: Internal antenna 1dBi gain (Max.)<br>2.4G WiFi: Internal antenna 2.5dBi gain (Max.) |
| Temperature Range: | -10℃~40℃ |
| Hardware Version: | T0 |
| Software Version: | 3.2.4_0028 |
| Sample No: | E20210414049301-0006 |
| I/O Port: | / |
| Note: | / |

# 2. LABORATORYAND ACCREDITATIONS

## 2.1. LABORATORY

The tests & measurements refer to this report were performed by Shenzhen EMC Laboratory of Guangzhou GRG Metrology & Test Co,. Ltd.


| | |
|---|---|
| Add.: | No.1301 Guanguang Road Xinlan Community, Guanlan Street, Longhua District Shenzhen, 518110, People's Republic of China. |
| P.C.: | 518000 |
| Tel : | 0755-61180008 |
| Fax: | 0755-61180008 |


## 2.2. ACCREDITATIONS

Our laboratoriesare 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** | Industry Canada |
| **USA** | FCC |

## 3. EVALUATION METHOD

Exposure category: General population/uncontrolled environment
EUT Type: Production Unit
Device Type: Mobile Device
Refer Standard: KDB 447498 D01 General RF Exposure Guidance v06
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 KDB447498D01 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.

## 4. LIMITS FOR GENERAL POPULATION/UNCONTROLLEDEXPOSURE

(B)Limits for General Population/Uncontrolled Exposure

| Frequency Range (MHz) | Electric Field Strength (E) (V/m) | Magnetic Field Strength(H) (A/m) | Power Density (S) ($Mw/cm^2$) | Averaging Time$[E]^2$, $[H]^2$ or S (minutes) |
|---|---|---|---|---|
| 0.3-1.34 | 614 | 1.63 | (100)* | 30 |
| 1.34-30 | 824/f | 2.19/f | (180/f)* | 30 |
| 30-300 | 27.5 | 0.073 | 0.2 | 30 |
| 300-1500 | / | / | F/1500 | 30 |
| 1500-100,000 | / | / | 1.0 | 30 |

Note: f=frequency in MHz; *Plane-wave equivalent power density

# 5. CALCULATION METHOD

Predication of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01
$S=PG/4\pi R^2$
Where: S=power density
P=power input to antenna
G=power gain of the antenna in the direction of interest relative to anisotropic radiator
R=distance to the center of radiation of the antenna
From the EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the maximum gain of the used as following information, the RF power density can be obtained.

| Frequency Band | Antenna type | Maximum antenna gain |
|---|---|---|
| 2.4GHz WiFi | Internal antenna | 2.5dBi |
| ZigBee | Internal antenna | 1dBi |

# 6. ESTIMATION RESULT

## 6.1 CONDUCTED POWER RESULTS

| Mode | Channel | Frequency(MHz) | Peak Conducted Output Power (dBm) |
|---|---|---|---|
| Zigbee | Lowest | 2405 | 8.68 |
| | Middle | 2440 | 8.73 |
| | Highest | 2475 | 8.62 |

| | Mode | Frequency(MHz) | Peak Conducted Output Power (dBm) |
|---|---|---|---|
| 2.4GHz Wifi | IEEE 802.11b | 2412 | 18.57 |
| | | 2437 | 18.79 |
| | | 2462 | 18.96 |
| | IEEE 802.11g | 2412 | 24.62 |
| | | 2437 | 24.61 |
| | | 2462 | 24.58 |
| | IEEE 802.11n HT20 | 2412 | 24.28 |
| | | 2437 | 24.39 |
| | | 2462 | 24.18 |
| | IEEE 802.11n HT40 | 2422 | 23.14 |
| | | 2437 | 23.28 |
| | | 2452 | 23.06 |

## 6.2 MANUFACTURING TOLERANCE

| Frequency (MHz) | Zigbee |
|---|---|
| | 2440 |
| Target (dBm) | 8 |
| Tolerance ±(dB) | 1.0 |

| Frequency (MHz) | 2.4GHz Wifi | | | |
|---|---|---|---|---|
| | IEEE 802.11b | IEEE 802.11g | IEEE 802.11n HT20 | IEEE 802.11n HT40 |
| | 2462 | 2412 | 2437 | 2437 |
| Target (dBm) | 18.0 | 24.0 | 24.00 | 22.00 |
| Tolerance ±(dB) | 1.0 | 1.0 | 1.0 | 1.0 |

## 6.3 MEASUREMENT RESULTS

### 6.3.1 STANDALONE MPE

| Mode | Output power | | Antenna Gain (dBi) | Antenna Gain (linear) | Duty Cycle | MPE ($mW/cm^2$) | MPE Limits ($mW/cm^2$) |
|---|---|---|---|---|---|---|---|
| | (dBm) | (mW) | | | | | |
| Zigbee | 9.00 | 7.9433 | 1 | 1.2589 | 100% | 0.0020 | 1.0000 |

**2.4G Wifi**

| Mode | Output power | | Antenna Gain (dBi) | Antenna Gain (linear) | Duty Cycle | MPE ($mW/cm^2$) | MPE Limits ($mW/cm^2$) |
|---|---|---|---|---|---|---|---|
| | (dBm) | (mW) | | | | | |
| IEEE 802.11 b | 19.00 | 79.4328 | 2.5 | 1.7783 | 100% | 0.0281 | 1.0000 |
| IEEE 802.11 g | 25.00 | 316.2278 | 2.5 | 1.7783 | 100% | 0.1119 | 1.0000 |
| IEEE 802.11 n HT20 | 25.00 | 316.2278 | 2.5 | 1.7783 | 100% | 0.1119 | 1.0000 |
| IEEE 802.11 n HT40 | 24.00 | 251.1886 | 2.5 | 1.7783 | 100% | 0.0889 | 1.0000 |

*Remark:*
1. *Maximum average power including tune-up tolerance;*
2. *MPE use distance is 20cm from manufacturer declaration of user manual.*

.

**Maximum Simultaneous transmission MPE Ratio for WLAN and Zigbee**

| Maximum MPE ratio 2.4G | Maximum MPE ratio Zigbee | ∑ MPEratios | Limit | Results |
|---|---|---|---|---|
| 0.1119 | 0.0020 | 0.1139 | 1.000 | Pass |

*Remark:*
*According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;*
*∑of MPE ratios≤ 1.0*

## 7. CONCLUSION

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

**----------This is the last page of the report. ----------**