

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: Test Engineer <i>Yu shanshan.</i>	Reviewed By: Technical Manager <i>Jiang Tao</i>	Approved By: Manager <i>John</i> 	
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.**

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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 DESCRIPTION OF EQUIPMENT UNDER 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
2.4G WiFi: 2412~2462MHz
Transmit Power: ZigBee: 8.73dBm
2.4G WiFi:
18.96dBm for 802.11b mode
24.62dBm for 802.11g mode
24.39dBm for 802.11n HT20 mode
23.28dBm for 802.11n HT40 mode
Modulation type: ZigBee: OQPSK
2.4G WiFi: DSSS, OFDM
Channel space: 5MHz
Antenna Specification: ZigBee: Internal antenna 1dBi gain (Max.)
2.4G WiFi: Internal antenna 2.5dBi gain (Max.)
Temperature Range: -10°C~40°C
Hardware Version: T0
Software Version: 3.2.4_0028
Sample No: E20210414049301-0006
I/O Port: /
Note: /

2. LABORATORY AND 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.
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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(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/UNCONTROLLED EXPOSURE

(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, $d=0.2\text{m}$, 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

2.4GHz Wifi	Mode	Frequency(MHz)	Peak Conducted Output Power (dBm)
	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 $\pm$ (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 $\pm$ (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	Σ MPE ratios	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;
 Σ 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.

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