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GRGTEST®

TEST REPORT

Verified Code: 218053

Report No.:	E20210426746801-13	Application No.:	E20210426746801
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:	Camera Hub G3		
Model:	CH-H03		
Test Specification:	CFR 47, FCC Part 2.1091		
Receipt Date:	2021-06-09		
Test Date:	2021-07-28 to 2021-08-07		
Issue Date:	2021-09-04		
Test Result:	Pass		
Prepared By: Test Engineer Yang Zhaojun	Reviewed By: Technical Manager Wu Haoming	Approved By: Manager 	
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. BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

Equipment: Camera Hub G3
Model No.: CH-H03
Adding Model: /
Trade Name: Aqara
FCC ID: 2AKIT-CHH03
Power Supply: DC5V power supplied by adapter
Adapter Specification: Adapter 1-US Plug
Model:A8A-050200U-US1
Input:100-240V~ 50/60Hz 0.35A
Output:5.0V  2.0A
Frequency Range: Zigbee: 2405~2475MHz
2.4G Wi-Fi: 2412~2462MHz
5G Wi-Fi:5180 MHz~5825 MHz
Transmit Power: Zigbee: 7.58dBm
2.4G Wi-Fi:
19.32dBm for 802.11b mode
21.93dBm for 802.11g mode
22.13dBm for 802.11n HT20 mode
22.91dBm for 802.11n HT40 mode
5G Wi-Fi:
U-NII-1:
10.12dBm for IEEE 802.11a
9.96dBm for IEEE 802.11n HT20
8.31dBm for IEEE 802.11ac VHT20
10.03dBm for IEEE 802.11n HT40
7.85dBm for IEEE 802.11ac VHT40
8.49dBm for IEEE 802.11ac VHT80
U-NII-2A:
10.39dBm for IEEE 802.11a
10.16dBm for IEEE 802.11n HT20
8.51dBm for IEEE 802.11ac VHT20
10.53dBm for IEEE 802.11n HT40

8.46dBm for IEEE 802.11acVHT40

9.05dBm for IEEE 802.11ac VHT80

U-NII-2C:

8.91dBm for IEEE 802.11a

8.27dBm for IEEE 802.11n HT20

6.82dBm for IEEE 802.11ac VHT20

8.77dBm for IEEE 802.11n HT40

6.67dBm for IEEE 802.11ac VHT40

7.00dBm for IEEE 802.11ac VHT80

U-NII-3:

8.34dBm for IEEE 802.11a

7.90dBm for IEEE 802.11n HT20

6.64dBm for IEEE 802.11acVHT20

8.07dBm for IEEE 802.11n HT40

6.01dBm for IEEE 802.11ac VHT40

6.65dBm for IEEE 802.11ac VHT80

Modulation type:

Zigbee: OQPSK

2.4G Wi-Fi: DSSS, OFDM

5G Wi-Fi: OFDM

Antenna

Zigbee: Internal antenna 2dBi gain (Max.)

Specification:

2.4G Wi-Fi: Internal antenna 3dBi gain (Max.)

5G Wi-Fi: Internal antenna 2dBi gain (Max.)

Temperature

-10℃~40℃

Range:

Hardware Version:

A20-GHC01-MIAN-X4

Software Version:

3.2.8_0003.0004

Sample No:

E20210426746801-0005

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.

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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)
China	CNAS(L0446)

The measuring facility of laboratories has been authorized or registered by the following approval agencies.

Canada	Industry Canada (Company Number: 24897)
USA	FCC

Copies of granted accreditation certificates are available for downloading from our web site, <http://www.grgtest.com>

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
5G Wi-Fi	Internal antenna	2dBi
2.4G Wi-Fi	Internal antenna	3dBi
Zigbee	Internal antenna	2dBi

6. ESTIMATION RESULT

6.1 CONDUCTED POWER RESULTS

Mode	Channel	Frequency(MHz)	Peak Conducted Output Power (dBm)
Zigbee	Lowest	2405	7.58
	Middle	2440	7.56
	Highest	2475	7.45

2.4G Wi-Fi	Mode	Frequency(MHz)	Peak Conducted Output Power (dBm)
	IEEE 802.11b	2412	19.32
		2437	19.21
		2462	18.97
	IEEE 802.11g	2412	21.53
		2437	21.93
		2462	21.72
	IEEE 802.11n HT20	2412	22.13
		2437	21.53
		2462	21.60
	IEEE 802.11n HT40	2422	22.60
		2437	22.28
		2452	22.91

5G Wi-Fi

Test Mode	Band	Frequency (MHz)	AVG Conducted Output Power (dBm)
802.11a	U-NII-1	5180	9.11
		5200	9.53
		5240	10.12
	U-NII-2A	5260	10.38
		5300	10.39
		5320	10.07
	U-NII-2C	5500	7.92
		5580	8.72
		5700	8.91
	U-NII-3	5745	7.94
		5785	8.27
		5825	8.34
802.11n HT20	U-NII-1	5180	8.91
		5200	9.54
		5240	9.96
	U-NII-2A	5260	9.84
		5300	10.16
		5320	9.87
	U-NII-2C	5500	7.67
		5580	8.27
		5700	8.06
	U-NII-3	5745	7.37
		5785	7.90
		5825	7.87
IEEE 802.11ac VHT20	U-NII-1	5180	7.22
		5200	7.67
		5240	8.31
	U-NII-2A	5260	8.51
		5300	8.19
		5320	8.23
	U-NII-2C	5500	5.91
		5580	6.82
		5700	6.49
	U-NII-3	5745	5.82
		5785	5.98
		5825	6.64
802.11n HT40	U-NII-1	5190	9.15
		5230	10.03
	U-NII-2A	5270	10.52
		5310	10.53
	U-NII-2C	5510	8.43
		5550	8.13
		5670	8.77
	U-NII-3	5755	7.83
		5795	8.07

802.11ac VHT40	U-NII-1	5190	7.47
		5230	7.85
	U-NII-2A	5270	8.36
		5310	8.46
	U-NII-2C	5510	5.84
		5550	6.32
		5670	6.67
	U-NII-3	5755	5.95
		5795	6.01
802.11ac VHT80	U-NII-1	5210	8.49
	U-NII-2A	5290	9.05
	U-NII-2C	5530	7.00
		5610	6.68
	U-NII-3	5775	6.65

6.2 MANUFACTURING TOLERANCE

Frequency (MHz)	Zigbee
	2405
Target (dBm)	7.0
Tolerance $\pm$ (dB)	1.0

Frequency (MHz)	2.4G Wi-Fi			
	IEEE 802.11b	IEEE 802.11g	IEEE 802.11n HT20	IEEE 802.11n HT40
	2412	2437	2412	2452
Target (dBm)	19.0	21.0	22.00	22.00
Tolerance $\pm$ (dB)	1.0	1.0	1.0	1.0

Frequency (MHz)	5G Wi-Fi			
	802.11a	802.11n HT20	802.11ac VHT20	802.11n HT40
	5300	5300	5260	5310
Target (dBm)	10.0	10.0	8.0	10.0
Tolerance $\pm$ (dB)	1.0	1.0	1.0	1.0

Frequency (MHz)	5G Wi-Fi	
	802.11ac VHT40	802.11ac VHT80
	5310	5290
Target (dBm)	8.0	9.0
Tolerance $\pm$ (dB)	1.0	1.0

6.3 MEASUREMENT RESULTS

6.3.1 STANDALONE MPE

Mode	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	(dBm)	(mW)				
Zigbee	8.00	6.3096	2	1.5849	0.0020	1.0000

2.4G Wi-Fi

Mode	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	(dBm)	(mW)				
IEEE 802.11 b	20.00	100.0000	3	1.9953	0.0397	1.0000
IEEE 802.11 g	22.00	158.4893	3	1.9953	0.0629	1.0000
IEEE 802.11 n HT20	23.00	199.5262	3	1.9953	0.0792	1.0000
IEEE 802.11 n HT40	23.00	199.5262	3	1.9953	0.0792	1.0000

5G Wi-Fi

Mode	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	(dBm)	(mW)				
IEEE 802.11 a	11.0	12.5893	2	1.5849	0.0040	1.0000
IEEE 802.11 n HT20	11.0	12.5893	2	1.5849	0.0040	1.0000
IEEE 802.11 n HT40	11.0	12.5893	2	1.5849	0.0040	1.0000
IEEE 802.11acVHT20	9.0	7.9433	2	1.5849	0.0025	1.0000
IEEE 802.11acVHT40	9.0	7.9433	2	1.5849	0.0025	1.0000
IEEE 802.11 acVHT80	10.0	10.0000	2	1.5849	0.0032	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 MPEratios	Limit	Results
0.0792	0.0020	0.0812	1.000	Pass

Maximum MPE ratio 5G	Maximum MPE ratio Zigbee	Σ MPEratios	Limit	Results
0.0040	0.0020	0.0060	1.000	Pass

Remark:

According to KDB447498 for Transmitters used in mobile exposure conditions for simultaneous transmission operations;
 $\sum \text{of MPE ratios} \leq 1.0$

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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