

1. RF Exposure Requirements

1.1 General Information

Client Information

Applicant:	Lumi United Technology Co., Ltd
Address of applicant:	B1, Chongwen Park, Nanshan iPark, Liuxian Avenue, Taoyuan Residential District, Nanshan District, Shenzhen, China
Manufacturer:	The same as Applicant
Address of manufacturer:	The same as Applicant

General Description of EUT:

Product Name:	Camera Hub G350
Trade Name:	Aqara
Model No.:	CH-C14E
Adding Model(s):	CH-C14D
Rated Voltage:	DC 5V
Battery Capacity:	/
Power Adapter:	/
FCC ID:	2AKIT-CHC14
Equipment Type:	Fixed device

Technical Characteristics of EUT:

Bluetooth

Bluetooth Version:	V5.4 (LE mode)
Frequency Range:	2402-2480MHz
RF Output Power:	1Mbps: 11.07dBm (Conducted) 2Mbps: 10.99dBm (Conducted)
Data Rate:	1Mbps, 2Mbps
Modulation:	GFSK
Quantity of Channels:	40
Channel Separation:	2MHz
Type of Antenna:	PIFA Antenna
Antenna Gain:	0dBi

Zigbee

Support Standards:	IEEE802.15.4
Frequency Range:	2405-2480MHz
RF Output Power:	8.51dBm (Conducted)
Type of Modulation:	QPSK
Quantity of Channels:	16
Channel Separation:	5MHz
Type of Antenna:	PIFA Antenna
Antenna Gain:	0.3dBi

Thread

Frequency Range:	2405-2480MHz
RF Output Power:	8.19dBm (Conducted)
Type of Modulation:	QPSK
Quantity of Channels:	16
Channel Separation:	5MHz
Type of Antenna:	PIFA Antenna
Antenna Gain:	0.3dBi

Wi-Fi 2.4G

Support Standards:	802.11b, 802.11g, 802.11n, 802.11ax
Frequency Range:	2412-2462MHz for 802.11b/g/n/ax(HT/HE20) 2422-2452MHz for 802.11n/ax(HT/HE40)
RF Output Power:	17.46dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM, 256QAM, 1024QAM
Quantity of Channels:	11 for 802.11b/g/n/ax(HT/HE20); 7 for 802.11n/ax(HT/HE40)
Channel Separation:	5MHz
Type of Antenna:	PIFA Antenna
Antenna Gain:	0dBi

Wi-Fi 5G

Support Standards:	802.11a, 802.11n-HT20, 802.11n-HT40, 802.11ac-VHT20/40, 802.11ax-HE20/40
Frequency Range:	5180-5240MHz, 5745-5825MHz
Max. RF Output Power:	15.21dBm (Conducted)
Type of Modulation:	BPSK, QPSK, 16QAM, 64QAM, 256AMQ, 1024QAM
Type of Antenna:	PIFA Antenna
Antenna Gain:	0.5dBi

1.2 RF Exposure Exemption

According to §1.1307(b)(3) and KDB 447498 D04 Interim General RF Exposure Guidance v01, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

Option A: FCC Rule Part 1.1307 (b)(3)(i)(A): The available maximum time-averaged power is no more than 1mW, regardless of separation distance.

Option B: FCC Rule Part 1.1307 (b)(3)(i)(B): The available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz;}$$

and

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

d = the separation distance (cm);

Option C: FCC Rule Part 1.1307 (b)(3)(i)(C): The minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters.

Single RF Sources Subject to Routine Environmental Evaluation	
RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$
1.34-30	$3,450 R^2/f^2$
30-300	$3.83 R^2$
300-1,500	$0.0128 R^2 f$
1,500-100,000	$19.2 R^2$

For Multiple RF sources: FCC Rule Part 1.1307(b)(3)(ii):

- (A) The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required).
- (B) In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure Limit_k} \leq 1$$

1.3 Calculated Result

Radio Access Technology	Prediction Frequency (MHz)	Output Power (dBm)	Antenna Gain (dBi)	Duty Cycle (%)	Tune-Up Time-Averaged Power (dBm)	ERP (dBm)
Bluetooth	2402	11.07	0	100	12.00	9.85
Zigbee	2405	8.51	0.3	100	9.00	7.15
Thread	2405	8.19	0.3	100	9.00	7.15
WiFi 2.4G	2412	17.46	0	100	18.00	15.85
WiFi 5G	5180	14.47	0.5	100	15.00	13.35
WiFi 5G	5745	15.21	0.5	100	16.00	14.35

Frequency (MHz)	Option	Min. Distance (cm)	Max. Power (dBm) (mW)		Exposure Limit (mW)	Ratio	Result Pass/Fail
2402	C	20.00	9.85	9.66	768.00	0.01	Pass
2405	C	20.00	7.15	5.19	768.00	0.01	Pass
2405	C	20.00	7.15	5.19	768.00	0.01	Pass
2412	C	20.00	15.85	38.46	768.00	0.05	Pass
5180	C	20.00	13.35	21.63	768.00	0.03	Pass
5745	C	20.00	14.35	27.23	768.00	0.04	Pass

Note: 1. Time-Averaged Power=Output Power * Duty Cycle; ERP= Time-Averaged Power+ Antenna gain-2.15dB

2. Option A, B and C refers as clause 1.2.

3. For option B, Max (time-averaged power, effective radiated power (ERP)) converts to Max. Power. For option C, ERP converts to Max. Power;

4. For option B, P_{th} (mW) converts to Exposure Limit (mW); For option C, ERP (W) converts to Exposure Limit (mW).

5. Ratio= Tune-Up ERP (mW)/ Exposure Limit (mW)

Mode for Simultaneous Multi-band Transmission:

Radio Access Technology	Ratio 1	Ratio 2	Simultaneous Ratio	Limit	Result Pass/Fail
Zigbee + WiFi 2.4G	0.01	0.05	0.06	1	Pass

Note: Bluetooth and Wi-Fi can't transmit at the same time; Thread and Zigbee can't transmit at the same time.

Result: Pass