

1. RF Exposure Requirements

1.1 General Information

Client Information

Applicant: SHENZHEN GIEC DIGITAL CO.,LTD
Address of applicant: 1st&3rd Building,No.26 Puzai Road,Pingdi,Longgang District,Shenzhen, China

Manufacturer: SHENZHEN GIEC DIGITAL CO.,LTD
Address of manufacturer: 1st&3rd Building,No.26 Puzai Road,Pingdi,Longgang District,Shenzhen, China

General Description of EUT:

Product Name: Smart Camera
Trade Name: /
Model No.: GK-IPC2034
Adding Model(s): GK-IPC2032, GK-IPC2033, GK-IPC2035, AD-CAM-OUT-WH-001
Rated Voltage: DC 12V
Battery Capacity: /
Model: JYSY1501-1201000U
Power Adapter: Input: 100-240V~50/60Hz 0.5A
Output: 12.0V-1.0A 12.0W
FCC ID: 2AHYK-GKIPC20AA
Equipment Type: Mobile device

Technical Characteristics of EUT:

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: Band 1: 16.83dBm (Conducted)
Band 4: 14.48dBm (Conducted)
Type of Modulation: QPSK, 16QAM, 64QAM, 256QAM
Type of Antenna: PCB Antenna
Antenna Gain: Band 1: 1.45dBi
Band 4: 1.31dBi

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: 16.78dBm (Conducted)
Type of Modulation: CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
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:	PCB Antenna
Antenna Gain:	1.42dBi
Bluetooth	
Bluetooth Version:	V5.1 (BLE mode)
Frequency Range:	2402-2480MHz
RF Output Power:	1Mbps: 5.63dBm (Conducted)
	2Mbps: 5.72dBm (Conducted)
Data Rate:	1Mbps, 2Mbps
Modulation:	GFSK
Quantity of Channels:	40
Channel Separation:	2MHz
Type of Antenna:	PCB Antenna
Antenna Gain:	1.42dBi

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	$0.0128 R^2f$
1,500-100,000	$19.2R^2$

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	Prediction Frequency	Output Power	Antenna Gain	Duty Cycle	Tune-Up Time-Averaged Power	ERP
Technology	(MHz)	(dBm)	(dBi)	(%)	(dBm)	(dBm)
Bluetooth	2402	5.72	1.42	100	6.00	5.27
Wi-Fi (2.4G)	2412	16.78	1.42	100	17.00	16.27
Wi-Fi (5G)	5180	16.83	1.45	100	17.00	16.30
Wi-Fi (5G)	5745	14.48	1.31	100	15.00	14.16

Frequency	Option	Min. Distance	Max. Power		Exposure Limit	Ratio	Result
(MHz)		(cm)	(dBm)	(mW)	(mW)		Pass/Fail
2402	C	20.00	5.27	3.37	768.00	0.01	Pass
2412	C	20.00	16.27	42.36	768.00	0.06	Pass
5180	C	20.00	16.30	42.66	768.00	0.06	Pass

5745	C	20.00	14.16	26.06	768.00	0.03	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
--	--	--	--	--	--

Note: BT and Wi-Fi can't transmit at the same time.

Result: Pass