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RF Exposure Report

Application No.:	FYCR2203000045AT
Applicant:	Shenzhen Jimi IoT Co., Ltd.
Address of Applicant:	3-4/F, Block A, Building #7, Shenzhen International Innovation Valley, Dashi 1st Road, Nanshan District, Shenzhen, Guangdong, China
Manufacturer:	Shenzhen Jimi IoT Co., Ltd.
Address of Manufacturer:	3-4/F, Block A, Building #7, Shenzhen International Innovation Valley, Dashi 1st Road, Nanshan District, Shenzhen, Guangdong, China
Factory:	Huizhou Xinsiwei Electronics Co., Ltd.
Address of Factory:	Factory Buildings 1 and 2, Jimi Industrial Park, 101 Jinfu Road, Xiaojinkou Subdistrict, Huicheng District, Huizhou, Guangdong, China
Equipment Under Test (EUT):	
EUT Name:	4G AI DashCam
Model No.:	JC450, JC450 AFX, JC450 PRO, JC450 PRO AFX ♣
♣	Please refer to section 2 of this report which indicates which model was actually tested and which were electrically identical.
Trade Mark:	JIMI
FCC ID:	2AMLF-JC450AFX
Standard(s) :	FCC Rules 47 CFR §2.1091 KDB 447498 D04 interim General RF Exposure Guidance v01
Date of Receipt:	2022-03-31
Date of Test:	2022-04-03 to 2022-06-21
Date of Issue:	2022-06-23
Test Result:	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

Winkey Wang
EMC Technical Manager

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2022-06-23		Original

Authorized for issue by:				
		Tree Zhan **Tree Zhan/Project Engineer**		
		Winkey Wang **Winkey Wang/Reviewer**		

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2 Contents

3 General Information

3.1 General Description of E.U.T.

Product Type:	☐ Portable device
	☒ Mobile device
	☐ Fixed device

3.2 Details of E.U.T.

Power supply:	Input: DC 9V-33V Output: DC 5.4V
For BT:	
Operation Frequency:	2402MHz to 2480MHz
Bluetooth Version:	V4.0 Classic
Modulation Type:	GFSK, pi/4DQPSK, 8DPSK
Number of Channels:	79
Channel Spacing:	1MHz
Spectrum Spread Technology:	Frequency Hopping Spread Spectrum(FHSS)
Antenna Type:	PIFA Antenna
Antenna Gain:	2.24dBi
For 2.4G:	
Operation Frequency:	802.11b/g/n(HT20): 2412MHz to 2462MHz; 802.11n(HT40): 2422MHz to 2452MHz
Modulation Type:	802.11b: DSSS (CCK, DQPSK, DBPSK); 802.11g/n: OFDM (64QAM, 16QAM, QPSK, BPSK)
Number of Channels:	802.11b/g/n(HT20):11; 802.11n(HT40):7
Channel Spacing:	5MHz
Antenna Type:	PIFA Antenna
Antenna Gain:	2.24dBi

For WCDMA:			
Testing frequency band:	Band	Tx (MHz)	Rx (MHz)
	Band II	1850-910	1930-1990
	Band IV	1710-1755	2110-2155
	Band V	824-849	869-894
Test Modulation:	QPSK		
Antenna Type:	Dipole Antenna		
Antenna Gain:	WCDMA Band II:4dBi, WCDMA Band IV: 4dBi WCDMA Band V: 4dBi		

For LTE:			
Testing frequency band:	LTE Band	Uplink (MHz)	Downlink (MHz)
	2	1850-910	1930-1990
	4	1710-1755	2110-2155
	5	824-849	869-894
	12	699-716	729-746
	13	777-787	746-756
	14	788-798	758-768
	66	1710-1780	2110-2200
	71	663-698	617-652
Test Modulation:	QPSK,16QAM		
Antenna Type:	Dipole Antenna		
Antenna Gain:	LTE Band2: 4dBi LTE Band4: 4dBi LTE Band5: 4dBi LTE Band12: 4dBi LTE Band13: 4dBi LTE Band14: 4dBi LTE Band66: 4dBi LTE Band71: 4dBi		

Declaration of EUT Family Grouping:

Model No.: JC450, JC450 AFX, JC450 PRO, JC450 PRO AFX

Only the model JC450 PRO AFX was tested, since according to the declaration from the applicant, the electrical circuit design, PCB layout, components used and internal wiring and functions were identical for the above models, with only difference on following:

1.JC450 PRO and JC450 PRO AFX added one N5 RX chip in order to support 5cameras, the rest of the circuit is exactly the same as the JC450 and JC450 AFX.

2.Products to ship will depend on the inventory in either of the following ways:

A. JC450 and JC450 AFX to ship will have no N5 AHD receivers on their main boards and JC450 Pro and JC450 Pro AFX to ship will have N5 AHD receivers on their main boards

B. JC450, JC450 Pro, JC450 AFX, and JC450 Pro AFX to ship will all have N5 AHD receivers on their main boards, but the N5 AHD receiver function on JC450 and JC450 AFX will be shielded via software.

Separation Distance

Minimum test separation distance:	20cm
Remark: This minimum test separation distance is determined by the smallest distance from the antenna and radiating structures or outer surface of the device, according to the host form factor, exposure conditions and platform requirements, to any part of the body or extremity of a user or bystander.	

3.3 Test Location

All tests were performed at:

Compliance Certification Services（Kunshan）Inc. Shenzhen branch.

Fuyong lab. Xinlong TechnoPark,Fengtang Road, Fuyong Subdistrict, Bao'an, Shenzhen, China

Tel: +86 755 8866 3988 Fax: +86 755 2671 0594

No tests were sub-contracted.

3.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

• **A2LA (Certificate No. 6606.01)**

Compliance Certification Services（Kunshan）Inc. Shenzhen branch is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 6606.01.

• **FCC –Designation Number: CN1322**

Compliance Certification Services（Kunshan）Inc. Shenzhen branch has been recognized as an accredited testing laboratory.

Designation Number: CN1322. Test Firm Registration Number: 718073

• **Innovation, Science and Economic Development Canada**

Compliance Certification Services（Kunshan）Inc. Shenzhen branch has been recognized by ISED as an accredited testing laboratory.

CAB identifier: CN0129.

IC#: 28189.

4 FCC Radiofrequency radiation exposure limits

Test exemptions apply for devices used in general population/uncontrolled exposure environments, according to the SAR-based, or MPE-based exemption thresholds.

4.1 Blanket 1 mW Blanket Exemption

The 1 mW Blanket Exemption of §1.1307(b)(3)(i)(A) applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power of no more than 1 mW, regardless of separation distance.

The 1-mW blanket exemption applies at separation distances less than 0.5 cm, including where there is no separation. This exemption shall not be used in conjunction with other exemption criteria other than those for multiple RF sources in paragraph §1.1307(b)(3)(ii)(A).

The 1-mW exemption is independent of service type and covers the full range of 100 kHz to 100 GHz, but it shall not be used in conjunction with other exemption criteria or in devices with higher-power transmitters operating in the same time-averaging period. Exposure from such higher-power transmitters would invalidate the underlying assumption that exposure from the lower-power transmitter is the only contributor to SAR in the relevant volume of tissue.

4.2 MPE-based Exemption

General frequency and separation-distance dependent MPE-based effective radiated power (ERP) thresholds are in Table B.1 [Table 1 of §1.1307(b)(1)(i)(C)] to support an exemption from further evaluation from 300 kHz through 100 GHz.

Table B.1—Thresholds For Single RF Sources Subject to Routine Environmental Evaluation

RF Source Frequency			Minimum Distance			Threshold ERP
f_L MHz		f_H MHz	$\lambda_L / 2\pi$		$\lambda_H / 2\pi$	W
0.3	–	1.34	159 m	–	35.6 m	1,920 R^2
1.34	–	30	35.6 m	–	1.6 m	3,450 R^2/f^2
30	–	300	1.6 m	–	159 mm	3.83 R^2
300	–	1,500	159 mm	–	31.8 mm	0.0128 R^2f
1,500	–	100,000	31.8 mm	–	0.5 mm	19.2R^2
Subscripts L and H are low and high; λ is wavelength. From §1.1307(b)(3)(i)(C), modified by adding Minimum Distance columns.						

The table applies to any RF source (i.e. single fixed, mobile, and portable transmitters) and specifies power and distance criteria for each of the five frequency ranges used for the MPE limits. These criteria apply at separation distances from any part of the radiating structure of at least λ/2π. The thresholds are

based on the general population MPE limits with a single perfect reflection, outside of the reactive near-field, and in the main beam of the radiator.

For mobile devices that are not exempt per Table B.1 [Table 1 of §1.1307(b)(1)(i)(C)] at distances from 20 cm to 40 cm and in 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in §1.1310 is necessary if the ERP of the device is greater than ERP_{20cm} in Formula (B.1) [repeated from §2.1091(c)(1); also in §1.1307(b)(1)(i)(B)].

$$P_{th}\,(\mathrm{mW}) = ERP_{20\,cm}\,(\mathrm{mW}) = \begin{cases} 2040f & 0.3\ \mathrm{GHz} \le f < 1.5\ \mathrm{GHz} \\ 3060 & 1.5\ \mathrm{GHz} \le f \le 6\ \mathrm{GHz} \end{cases} \qquad (B.1)$$

If the ERP is not easily obtained, then the available maximum time-averaged power may be used (i.e., without consideration of ERP only if the physical dimensions of the radiating structure(s) do not exceed the electrical length of λ/4 or if the antenna gain is less than that of a half-wave dipole.

SAR-based exemptions are constant at separation distances between 20 cm and 40 cm to avoid discontinuities in the threshold when transitioning between SAR-based and MPE-based exemption criteria at 40 cm, considering the importance of reflections.

Limit calculation			
Frequency range	Frequency(MHz)	R(λ/2π)(m)	Threshold ERP(W)
300~1500MHz	**915**	0.0522	0.032
1500~100000MHz	**2480**	0.0193	0.007

4.3 SAR-based Exemption

SAR-based thresholds are derived based on frequency, power, and separation distance of the RF source. The formula defines the thresholds in general for either available maximum time-averaged power or maximum time-averaged ERP, whichever is greater.

If the ERP of a device is not easily determined, such as for a portable device with a small form factor, the applicant may use the available maximum time-averaged power exclusively if the device antenna or radiating structure does not exceed an electrical length of λ/4.

As for devices with antennas of length greater than λ/4 where the gain is not well defined, but always less than that of a half-wave dipole (length λ/2), the available maximum time-averaged power generated by the device may be used in place of the maximum time-averaged ERP, where that value is not known.

The separation distance is the smallest distance from any part of the antenna or radiating structure for all persons, during operation at the applicable ERP. In the case of mobile or portable devices, the separation distance is from the outer housing of the device where it is closest to the antenna.

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The SAR-based exemption formula of §1.1307(b)(3)(i)(B), repeated here as Formula (B.2), applies for single fixed, mobile, and portable RF sources with available maximum time-averaged power or effective radiated power (ERP), whichever is greater, of less than or equal to the threshold P_{th} (mW).
This method shall only be used at separation distances from 0.5 cm to 40 cm and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by Formula (B.2).

$$P_{\text{th}}\ (\text{mW}) = \begin{cases} ERP_{20\ \text{cm}}(d/20\ \text{cm})^{x} & d \le 20\ \text{cm} \\ ERP_{20\ \text{cm}} & 20\ \text{cm} < d \le 40\ \text{cm} \end{cases} \qquad \text{(B.2)}$$

where

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

and f is in GHz, d is the separation distance (cm), and ERP_{20cm} is per Formula (B.1).

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Example values shown in Table B.2 are for illustration only.

Table B.2—Example Power Thresholds (mW)

Frequency (MHz)	Distance(mm)									
	5	10	15	20	25	30	35	40	45	50
300	39	65	88	110	129	148	166	184	201	217
450	22	44	67	89	112	135	158	180	203	226
835	9	25	44	66	90	116	145	175	207	240
1900	3	12	26	44	66	92	122	157	195	236
2450	3	10	22	38	59	83	111	143	179	219
3600	2	8	18	32	49	71	96	125	158	195
5800	1	6	14	25	40	58	80	106	136	169

Limit calculation				
Frequency range(GHz)	Frequency(GHz)	X	Distance(cm)	Pth (mW)
0.3~1.5	**0.824**	1.405	**20**	**1680.960**
1.5~6	**2**	1.858	**20**	**3060.000**

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5 Measurement and Calculation

5.1 Maximum transmit power

BT:

Test Mode	Test Channel	EIRP [dBm]	EIRP (mW)	Limit(mW)	Ratio	Verdict
BT	2441	5.80	3.80	3060	0.001	Pass

Note1:The maximum conducted output power is based on the RF Test report FYCR220300004501

2.4G Wi-Fi:

Test Mode	Test Channel	EIRP [dBm]	EIRP (mW)	Limit(mW)	Ratio	Verdict
2.4G Wi-Fi	2412	10.29	10.69	3060	0.003	Pass

Note1:The maximum conducted output power is based on the RF Test report FYCR220300004502.

LTE Module (Operating Frequency Below 1GHz):

Test Mode	ERP [dBm]	ERP (mW)	Limit(mW)	Ratio	Verdict
WCDMA Band V	26.85	484.17	1680.96	0.288	Pass
LTE Band 5	26.85	484.17	1680.96	0.288	Pass
LTE Band 12	26.85	484.17	1425.96	0.340	Pass
LTE Band 13	26.85	484.17	1585.08	0.305	Pass
LTE Band 14	26.85	484.17	1607.52	0.301	Pass
LTE Band 71	26.85	484.17	1352.52	0.358	Pass

Note1: The maximum conducted output power is based on the test report R1907A0408-R3V1

Note2: ERP= maximum conducted output power+antenna gain-2.15

LTE Module (Operating Frequency Above 1GHz):

Test Mode	EIRP [dBm]	EIRP (mW)	Limit(mW)	Ratio	Verdict
WCDMA Band II	29	794.33	3060	0.260	Pass
WCDMA Band IV	29	794.33	3060	0.260	Pass
LTE Band 2	29	794.33	3060	0.260	Pass
LTE Band 4	29	794.33	3060	0.260	Pass
LTE Band 66	29	794.33	3060	0.260	Pass

Note1: The maximum conducted output power is based on the test report R1907A0408-R3V1

Note2: EIRP= maximum conducted output power+antenna gain

Simultaneous transmitting

2.4G Wi-Fi Module+LTE Module

Ratio of Power (mW) of 2.4G Wi-Fi at R = 20 cm	Ratio of Power (mW) of LTE Band 71 at R = 20 cm	Total ratios of simultaneous transmitting at R =20cm	Limit	Result
0.003	0.358	0.361	1.0	PASS

5.2 RF Exposure Calculation

Remark: we used the maximum power between the conducted power and ERP/EIRP to perform RF exposure exemption evaluation.

	Evaluation method	Exempt Limit(mW)	Verdict
☐	Blanket 1 mW Blanket Exemption	1mW	N/A
☐	MPE-based Exemption(ERP)	7mW(ERP)	N/A
☒	SAR-based Exemption(P_{th})	3060mW	Yes

So, the device is to qualify for SAR test exemption, the exemption report is in lieu of the SAR report.

--End of the Report--