TEST REPORT

Application No.:	SZCR2502000491AT
Applicant:	SZ Knowact Robot Technology Co., Ltd
Address of Applicant:	Room C3-A081, Building C, Kexing Science Park, No. 15, Keyuan Road, Science Park Community, Yuehai Street, Nanshan District, Shenzhen, China
Manufacturer:	SZ Knowact Robot Technology Co., Ltd
Address of Manufacturer:	Room C3-A081, Building C, Kexing Science Park, No. 15, Keyuan Road, Science Park Community, Yuehai Street, Nanshan District, Shenzhen, China
Factory:	SZ Knowact Robot Technology Co., Ltd
Address of Factory:	Room C3-A081, Building C, Kexing Science Park, No. 15, Keyuan Road, Science Park Community, Yuehai Street, Nanshan District, Shenzhen, China
Equipment Under Test (EUT):	
EUT Name:	Caelone 01
Model No.:	AUDAFV
FCC ID:	2BMUV-AUDAFV25
Standard(s) :	FCC Rules 47 CFR §2.1091 KDB 447498 D04 interim General RF Exposure Guidance v01
Date of Receipt:	2025-02-13
Date of Test:	2025-02-21 to 2025-03-20
Date of Issue:	2025-04-01
Test Result:	**Pass***

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

Keny Xu
EMC Laboratory Manager

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2025-04-01		Original

Authorized for issue by:				
		Donjon Huang **Donjon Huang/Project Engineer**		
		Eric Fu **Eric Fu/Reviewer**		

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1 Contents

Page

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2 General Information

2.1 General Description of E.U.T.

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

2.2 Details of E.U.T.

Power supply:	Powered by Lithium Ion Rechargeable Battery. Battery information Model: WAADFBS Nominal voltage: 7.3V
Cable Loss (for RF conducted test):	0.9dB
For BLE:	
Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK
Number of Channels:	40
Channel Spacing:	2MHz
Antenna Type:	Integral Antenna
Antenna Gain:	1dBi
Antenna Number:	1
For 2.4G WIFI:	
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:	Integral Antenna
Antenna Gain:	1dBi
Antenna Number:	1
For 5G WIFI:	
Operation Frequency/Number of channels (20MHz):	U-NII-3: 5745-5825MHz (5 Channels)
Operation Frequency/Number of channels/(40MHz):	U-NII-3: 5755-5795MHz (2 Channels)
Operation	U-NII-3: 5775MHz (1 Channel)

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Frequency/Number of channels (80MHz):	
Modulation Type:	OFDM (64QAM, 16QAM, QPSK, BPSK) 802.11n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
Channel Spacing:	802.11a/n/ac 20: 20MHz 802.11n/ac 40: 40MHz 802.11ac 80: 80MHz
Antenna Type:	Integral Antenna
Antenna Gain:	1dBi
Antenna Number:	1
For 2.4G SDR:	
Operation Frequency:	1.4MHz(Mode 1): 2403.5MHz-2467.5MHz(33channel) 1.4MHz(Mode 2): 2405.12MHz-2469.12MHz(33channel) 3MHz(Mode 1): 2405.5MHz-2465.5MHz(21channel) 3MHz(Mode 2): 2408.2MHz-2468.2MHz(21channel) 5MHz: 2404.5MHz-2469.5MHz(14channel) 10MHz: 2407.5MHz-2467.5MHz(61channel) 20MHz: 2412.5MHz-2462.5MHz(51channel) 40MHz: 2422.5MHz-2452.5MHz(31channel) 60MHz: 2432.5MHz-2442.5MHz(11channel)
Modulation Type:	OFDM
Channel Spacing:	1.4MHz(Mode 1): 2MHz 1.4MHz(Mode 2): 2MHz 3MHz(Mode 1): 3MHz 3MHz(Mode 2): 3MHz 5MHz: 5MHz 10MHz: 1MHz 20MHz: 1MHz 40MHz: 1MHz 60MHz: 1MHz
Antenna Type:	Integral Antenna
Antenna Gain:	ANT0: 1dBi, ANT1: 1dBi, ANT2: 1dBi, ANT3: 1dBi
For 5G SDR:	
Operation Frequency:	5.1G SDR 10MHz: 5157MHz-5245MHz(89channel) 20MHz: 5161MHz-5240MHz(80channel) 40MHz: 5170MHz-5230MHz(61channel) 5.8G SDR 1.4MHz(Mode 1): 5728.5MHz-5846.5MHz(59channel) 1.4MHz(Mode 2): 5730.12MHz-5848.12MHz(59channel) 3MHz(Mode 1): 5727.5MHz-5844.5MHz(40channel) 3MHz(Mode 2): 5730.2MHz-5847.2MHz(40channel) 5MHz: 5732.5MHz-5842.5MHz(18channel) 10MHz: 5730.5MHz-5844.5MHz(115channel)

	20MHz: 5735.5MHz-5839.5MHz(105channel) 40MHz: 5745.5MHz-5829.5MHz(85channel) 60MHz: 5755.5MHz-5819.5MHz(65channel) 80MHz: 5765.5MHz-5809.5MHz(45channel)
Modulation Type:	OFDM
Channel Spacing:	5.1G SDR 10MHz: 1MHz 20MHz: 1MHz 40MHz: 1MHz 5.8G SDR 1.4MHz(Mode 1): 2MHz 1.4MHz(Mode 2): 2MHz 3MHz(Mode 1): 3MHz 3MHz(Mode 2): 3MHz 5MHz: 5MHz 10MHz: 1MHz 20MHz: 1MHz 40MHz: 1MHz 60MHz: 1MHz 80MHz: 1MHz
Antenna Type:	PIFA
Antenna Gain:	5.1G SDR: ANT0: 1dBi, ANT1: 1dBi, ANT2: 1dBi, ANT3: 1dBi 5.8G SDR: ANT0: 1.5dBi, ANT1: 1.5dBi, ANT2: 1.5dBi, ANT3: 1.5dBi

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.	

2.3 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen Branch
No. 1 Workshop, M-10, Middle Section, Science & Technology Park, Nanshan District, Shenzhen, Guangdong, China. 518057.

Tel: +86 755 2601 2053 Fax: +86 755 2671 0594

No tests were sub-contracted.

2.4 Test Facility

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

• A2LA (Certificate No. 3816.01)

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory is accredited by the American Association for Laboratory Accreditation(A2LA). Certificate No. 3816.01.

• VCCI (Member No. 1937)

The 3m Fully-anechoic chamber for above 1GHz, 10m Semi-anechoic chamber for below 1GHz, Shielded Room for Mains Port Conducted Interference Measurement and Telecommunication Port Conducted Interference Measurement of SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen EMC laboratory have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: G-20026, R-14188, C-12383 and T-11153 respectively.

• FCC –Designation Number: CN1336

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized as an accredited testing laboratory.
Designation Number: CN1336. Test Firm Registration Number: 787754.

• Innovation, Science and Economic Development Canada

SGS-CSTC Standards Technical Services Co., Ltd., Shenzhen EMC Laboratory has been recognized by ISED as an accredited testing laboratory.
CAB identifier: CN0006.
IC#: 4620C.

3 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.

3.1 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.

3.2 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)].

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

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

3.3 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.

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	**0.915**	1.474	**0.5**	**8.133**
1.5~6	**2.48**	1.905	**0.5**	**2.717**

4 Measurement and Calculation

Standalone transmission:

Mode	Frequency (MHz)	Maximum EIRP (dBm)	Maximum EIRP (mW)	Limit (mW)	Ratio	Verdict
BLE	2440	3.96	2.49	3060	0.022	Pass
2.4G Wi-Fi	2452	14.03	25.29	3060	0.071	Pass
2.4G SDR ANT0	2437.5	23.37	217.27	3060	0.209	Pass
2.4G SDR ANT1	2437.5	22.91	195.43	3060	0.198	Pass
2.4G SDR ANT2	2437.5	23.46	221.82	3060	0.211	Pass
2.4G SDR ANT3	2462.5	23.22	209.89	3060	0.206	Pass
5.8G Wi-Fi	5745	15.35	34.28	3060	0.083	Pass
5.1G SDR ANT0	5200	16.28	42.46	3060	0.093	Pass
5.1G SDR ANT1	5200	16.04	40.18	3060	0.090	Pass
5.1G SDR ANT2	5200	16.45	44.16	3060	0.094	Pass
5.1G SDR ANT3	5200	16.26	42.27	3060	0.092	Pass
5.8G SDR ANT0	5787.5	23.16	207.01	3060	0.204	Pass
5.8G SDR ANT1	5787.5	23.50	223.87	3060	0.212	Pass
5.8G SDR ANT2	5787.5	23.73	236.05	3060	0.218	Pass
5.8G SDR ANT3	5730.5	22.85	192.75	3060	0.197	Pass

Note1: the EIRP for BLE refer to report SZCR250200049102.

Note2: the EIRP for 2.4G Wi-Fi refer to report SZCR250200049103.

Note3: the EIRP for 5G WIFI refer to report SZCR250200049104

Note4: the EIRP for 2.4G SDR refer to report SZCR250200049105

Note5: the EIRP for 5G SDR refer to report SZCR240600249806.

Simultaneous transmission

Mode	Total Ratio	Limit	Result
BLE+5.1G SDR ANT0	0.115	1.0	Pass
BLE+5.1G SDR ANT1	0.112	1.0	Pass
BLE+5.1G SDR ANT2	0.116	1.0	Pass
2.4G Wi-Fi+5.1G SDR ANT0	0.164	1.0	Pass
2.4G Wi-Fi +5.1G SDR ANT1	0.161	1.0	Pass
2.4G Wi-Fi +5.1G SDR ANT2	0.165	1.0	Pass
BLE+5.8G SDR ANT0	0.226	1.0	Pass
BLE+5.8G SDR ANT1	0.234	1.0	Pass
BLE+5.8G SDR ANT2	0.240	1.0	Pass
2.4G Wi-Fi+5.8G SDR ANT0	0.275	1.0	Pass
2.4G Wi-Fi +5.8G SDR ANT1	0.283	1.0	Pass
2.4G Wi-Fi +5.8G SDR ANT2	0.289	1.0	Pass
5.8G Wi-Fi+2.4G SDR ANT0	0.292	1.0	Pass
5.8G Wi-Fi+2.4G SDR ANT1	0.281	1.0	Pass
5.8G Wi-Fi+2.4G SDR ANT2	0.294	1.0	Pass
5.1G SDR ANT0+5.1G SDR ANT1	0.183	1.0	Pass
5.1G SDR ANT0+5.1G SDR ANT3	0.182	1.0	Pass
5.1G SDR ANT2+5.1G SDR ANT1	0.184	1.0	Pass
5.1G SDR ANT2+5.1G SDR ANT3	0.186	1.0	Pass
5.8G SDR ANT0+5.8G SDR ANT1	0.416	1.0	Pass
5.8G SDR ANT0+5.8G SDR ANT3	0.422	1.0	Pass
5.8G SDR ANT2+5.8G SDR ANT1	0.430	1.0	Pass
5.8G SDR ANT2+5.8G SDR ANT3	0.415	1.0	Pass

The EUT meet the Exemption Limits for Routine Evaluation – SAR Evaluation, so no SAR evaluation is required for the EUT.

--End of the Report--

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