RF EXPOSURE EVALUATION REPORT

Application No.:	FYCR2212000519AT
Applicant:	WeHome Technology Company Limited
Address of Applicant:	Room 12A, Kiu Fu Comm Building, 300 Lockhart Road, Wan Chai Hong Kong
Manufacturer:	Fuzhi Technology (Shenzhen) Co., Ltd.
Address of Manufacturer:	Room 302-303, 3nd Floor, Building 10, Qianhai Shengang Youth Dreamworks, No. 35 Qianwan 1st Road, Qianhai-Hong Kong Cooperation Zone, Shenzhen
Factory:	Shenzhen Zowee Smart Manufacturing Co., Ltd.
Address of Factory:	Factory 1, Factory 2-3 and Dormitory No.1 & Dormitory No.2, No.149, Tangxiachong Second Industrial Road, Tangxiachong Community, Yanluo Street, Bao'an District, Shenzhen City, Guangdong
Equipment Under Test (EUT):	
EUT Name:	EBO X Family Companion Robot
Model No.:	EBO X
Trade Mark:	Enabot
FCC ID:	2AUR8-EBOX01
Standard(s) :	FCC Rules 47 CFR §2.1091
	KDB 447498 D04 interim General RF Exposure Guidance v01
Date of Receipt:	2022-12-21
Date of Evaluation:	2023-03-09 to 2023-03-16
Date of Issue:	2023-03-21
Evaluation Result:	**Pass***

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

Winkey Wang
EMC Technical Manager

Revision Record				
Version	**Chapter**	**Date**	**Modifier**	**Remark**
01		2023-03-21		Original

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

2 Contents

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中国·深圳·宝安区福永街道凤塘大道鑫龙科技园福永实验室 邮编: 518103 t (86–755) 88663988 f (86–755) 26710594 sgs.china@sgs.com

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:	Charged by charging panel via AC adapter AC Adapter information Model: K36V190180J Input: 100-240V~ 50/60Hz 0.9A Output: 19.0V 1.8A Rechargeable Li-ion Battery pack information Model: B0750 Nominal voltage: 10.8V Rated Capacity: 2400mAh/25.92Wh
For BT:	
Bluetooth Version:	V5.0 Classic
Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK, Pi/4DQPSK, 8DPSK
Channel Spacing:	1MHz
Number of Channels:	79
Antenna Type:	Ceramic Antenna
Antenna Gain:	-16.75dBi
For 2.4G Wi-Fi:	
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)
Channel Spacing:	5MHz
Number of Channels:	802.11b/g/n(HT20): 11, 802.11n(HT40):7
Antenna Type:	PIFA Antenna
Antenna Gain:	RTL8189FTV: 4.55dBi RTL8811CU: 4.22dBi

For 2.4GHz self-defined radio:	
Operation Frequency:	2402MHz to 2480MHz
Modulation Type:	GFSK, Pi/4DQPSK, 8DPSK
Channel Spacing:	1MHz
Number of Channels:	79
Antenna Type:	Ceramic Antenna
Antenna Gain:	-5.86dBi
For 5G Wi-Fi:	
Operation Frequency (20MHz):	U-NII-1: 5180MHz-5240MHz
Operation Frequency (40MHz):	U-NII-1: 5190MHz-5230MHz
Operation Frequency (80MHz):	U-NII-1: 5210MHz
Channel number (20MHz):	U-NII-1: 4
Channel number (40MHz):	U-NII-1: 2
Channel number (80MHz):	U-NII-1: 1
Modulation Type:	802.11a: 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(HT20)/ac(HT20): 20MHz; 802.11n(HT40)/ac(HT40): 40MHz; 802.11ac(HT80): 80MHz
DFS Function:	Slave without Radar detection
TPC Function:	Without TPC function
Antenna Type:	PIFA Antenna
Antenna Gain:	U-NII-1: 4.21dBi

Remark: The information in this section is provided by the applicant or manufacturer, CCS is not liable to the accuracy, suitability, reliability or/and integrity of the information.

3.3 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.	

3.4 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.

3.5 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.

3.6 Deviation from Standards

None

3.7 Abnormalities from Standard Conditions

None

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.

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).

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**

5 Measurement and Calculation

5.1 Maximum transmit power

For BT:

Antenna Gain: -16.75dBi

Output Power Into Antenna & RF Exposure Evaluation Distance:

Frequency	Maximum Conducted Power [dBm]	Maximum Conducted Power (mW)	Limit	Ratio
2402	3.26	2.12	3060	0.0007

Note: Refer to report No. FYCR221200051902 for EUT test Max Power Value.

The distance r (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

For 2.4G Wi-Fi:

Antenna Gain: RTL8189FTV: 4.55dBi, RTL8811CU: 4.22dBi

Output Power Into Antenna & RF Exposure Evaluation Distance:

Wi-Fi module: RTL8189FTV

Frequency	Maximum EIRP [dBm]	Maximum EIRP (mW)	Limit	Ratio
2462	19.77	94.84	3060	0.0310

Wi-Fi module: RTL8811CU

Frequency	Maximum EIRP [dBm]	Maximum EIRP (mW)	Limit	Ratio
2412	19.13	81.85	3060	0.0267

Note: Refer to report No. FYCR221200051903 for EUT test Max Power Value.

The distance r (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

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For 2.4GHz self-defined radio:

Antenna Gain: -5.86dBi

Output Power Into Antenna & RF Exposure Evaluation Distance:

Frequency	Maximum Conducted Power [dBm]	Maximum Conducted Power (mW)	Limit	Ratio
2441	1.12	1.29	3060	0.0004

Note: Refer to report No. FYCR221200051904 for EUT test Max Power Value.

The distance r (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

For 5G Wi-Fi:

Antenna Gain: U-NII-1: 4.21dBi

Output Power Into Antenna & RF Exposure Evaluation Distance:

Frequency	Maximum EIRP [dBm]	Maximum EIRP (mW)	Limit	Ratio
5240	19.17	82.60	3060	0.0270

Note: Refer to report No. FYCR221200051905 for EUT test Max Power Value.

The distance r (4th column) calculated from the Fries transmission formula is far greater than 20 cm separation requirement.

5.2 RF Exposure Calculation

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

For BT transmitter:

The Max Power is 2.12mW. The best case gain of the antenna is -16.75dBi.

	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})	3060	Yes

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

For 2.4G Wi-Fi transmitter:

The Max Power is 94.84mW.

The best case gain of the antennas are: RTL8189FTV: 4.55dBi, RTL8811CU: 4.22dBi

	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})	3060	Yes

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

For 2.4GHz self-defined radio transmitter:

The Max Power is 1.29mW. The best case gain of the antenna is -5.86dBi.

	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})	3060	Yes

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

For 5G Wi-Fi transmitter:

The Max Power is 82.60mW. The best case gain of the antenna U-NII-1: 4.21dBi

	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})	3060	Yes

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

Maximum simultaneously transmission

Ratio of Power (mW) of 2.4G self-defined radio at R = 20 cm	Ratio of Power (mW) of BT at R = 20 cm	Ratio of Power (mW) of 2.4G Wi-Fi at R = 20 cm	Total ratios of simultaneous transmitting at R =20cm	Limit	Result
0.0004	0.0007	0.0310	0.0321	1.0	PASS

Note: Wi-Fi module RTL8189FTV and Wi-Fi module RTL8811CU do not support simultaneous transmission

--End of the Report--