



RF Exposure Evaluation Report

Report No.: JYTSZ-R12-2400558
Applicant: Hangzhou Roombanker Technology Co., Ltd.
Address of Applicant: A#801 Wantong center, Hangzhou, China

Equipment Under Test (EUT)

Product Name: Industrial AI Edge Computing Gateway
Model No.: DSGW-380, DSGW-380-1, DSGW-380-2, DSGW-380-3, DSGW-380-4, DSGW-380-X(X:1~29)
Trade mark: Roombanker
FCC ID: 2AUXBDSGW-380
Applicable standards: FCC CFR Title 47 Part 2 (§2.1091)
Date of sample receipt: 26 Feb., 2024
Date of Test: 27 Feb., to 29 May, 2024
Date of report issue: 29 May, 2024
Test Result: PASS

Project by:		Date:	29 May, 2024
Reviewed by:		Date:	29 May, 2024
Approved by:	Janet. Wei Manager	Date:	29 May, 2024

This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in above the application standard version. Test results reported herein relate only to the item(s) tested.

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1 Version

Version No.	Date	Description
00	29 May, 2024	Original

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3 General Information

3.1 Client Information

Applicant:	Hangzhou Roombanker Technology Co., Ltd.
Address:	A#801 Wantong center, Hangzhou, China
Manufacturer/Factory:	Zhejiang Dusun Electron Co., Ltd.
Address:	No.640 Feng Qing St, DeQing Zhejiang China

3.2 General Description of E.U.T.

Product Name:	Industrial AI Edge Computing Gateway
Model No.:	DSGW-380, DSGW-380-1, DSGW-380-2, DSGW-380-3, DSGW-380-4, DSGW-380-X(X:1~29)
BLE Specification	
Operation Frequency:	2402MHz-2480MHz
Channel number:	40
Channel separation:	2MHz
Modulation	GFSK
Antenna Type:	External Antenna
Antenna gain:	1.61 dBi (declare by Applicant)
2.4GWi-Fi Specification	
Operation Frequency:	2412 MHz - 2462 MHz (802.11b, g, n-HT20,ax-HE20)
	2422 MHz - 2452 MHz (802.11n-HT40, ax-HE40)
Channel Numbers:	11 (802.11b, g, n-HT20, ax-HE20)
	7 (802.11n-HT40, ax-HE40)
Channel Separation:	5MHz
Modulation Technology: (IEEE 802.11b)	DSSS-DBPSK, DQPSK, CCK
Modulation Technology: (IEEE 802.11g/n/ax)	OFDM-BPSK, QPSK, 16QAM, 64QAM
Antenna Type:	External Antenna
Antenna Gain:	Wi-Fi ANT 1 : 1.61 dBi (declare by applicant)
	Wi-Fi ANT 2 : 1.61 dBi (declare by applicant)

5GWi-Fi Specification	
Operation Frequency:	Band 1: 5150 MHz - 5250 MHz Band 4: 5725 MHz - 5850 MHz
Channel Numbers:	Band 1: 4 , Band 4: 5 (802.11a, n-HT20, ac-VHT20, ax-HE20) Band 1, 4: 2 (802.11n-HT40, ac-VHT40, ax-HE40) Band 1, 4: 1 (802.11ac-VHT80, ax-HE80)
Modulation Technology: (IEEE 802.11a/802.11n)	OFDM-BPSK, QPSK, 16QAM, 64QAM
Modulation Technology: (IEEE 802.11ac)	OFDM-BPSK, QPSK, 16QAM, 64QAM, 256QAM
Modulation Technology: (IEEE 802.11ax)	OFDMA-BPSK, QPSK, 16QAM, 64QAM, 256QAM, 1024QAM
Antenna Type:	External Antenna
Antenna Gain:	Wi-Fi ANT 1 : 5.2G 0.75 dBi (declare by applicant) 5.8G 0.87 dBi (declare by applicant) Wi-Fi ANT 2 : 5.2G 0.75 dBi (declare by applicant) 5.8G 0.87 dBi (declare by applicant)
Lora 125KHz Specification	
Operation Frequency:	902 MHz - 915 MHz
Channel Numbers:	64
Channel Separation:	200KHz
Modulation Technology:	Lora
Antenna Type:	External Antenna
Antenna Gain:	1.39 dBi (declare by applicant)
Lora 500KHz Specification	
Operation Frequency:	923 MHz - 928 MHz
Channel Numbers:	8
Channel Separation:	400KHz,600KHz,
Modulation Technology:	Lora
Antenna Type:	External Antenna
Antenna Gain:	1.31 dBi (declare by applicant)

WCDMA Specification			
Operation Frequency Range:	WCDMA band II:	1852.4 MHz - 1907.6 MHz	
	WCDMA band IV:	1712.4 MHz - 1752.6 MHz	
	WCDMA band V:	826.4 MHz - 846.6 MHz	
Modulation Type:	☒ RMC(QPSK)	☒ HSUPA(QPSK)	☒ HSDPA(QPSK,16QAM)
Antenna Type:	External Antenna		
Antenna Gain:	WCDMA band II:	2.14 dBi (declare by Applicant)	
	WCDMA band IV:	2.64 dBi (declare by Applicant)	
	WCDMA band V:	-0.82 dBi (declare by Applicant)	
LTE Specification			
Operation Frequency Range:	LTE band 2:	Tx: 1850 MHz - 1910 MHz	Rx: 1930 MHz - 1990 MHz
	LTE band 4:	Tx: 1710 MHz - 1755 MHz	Rx: 2110 MHz - 2155 MHz
	LTE band 5:	Tx: 824 MHz - 849 MHz	Rx: 869 MHz - 894 MHz
	LTE band 7:	Tx: 2500 MHz - 2570 MHz	Rx: 2620 MHz - 2690 MHz
	LTE band 12:	Tx: 699 MHz - 716 MHz	Rx: 729 MHz - 746 MHz
	LTE band 13:	Tx: 777 MHz - 787 MHz	Rx: 746 MHz - 756 MHz
	LTE band 14:	Tx: 788 MHz - 798 MHz	Rx: 758 MHz - 768 MHz
	LTE band 17:	Tx: 704 MHz - 716 MHz	Rx: 734 MHz - 746 MHz
	LTE band 25:	Tx: 1850 MHz - 1915 MHz	Rx: 1930 MHz - 1995 MHz
	LTE band 26:	Tx: 814 MHz - 849 MHz	Rx: 859 MHz - 894 MHz
	LTE band 38:	Tx: 2570 MHz - 2620 MHz	Rx: 2570 MHz - 2620 MHz
	LTE band 41:	Tx: 2496 MHz - 2690 MHz	Rx: 2496 MHz - 2690 MHz
	LTE band 66:	Tx: 1710 MHz - 1780 MHz	Rx: 2110 MHz - 2200 MHz
	LTE band 71:	Tx: 663 MHz - 698 MHz	Rx: 617 MHz - 652 MHz
CA Band :	CA_2C, CA_5B, CA_7C, CA_38C, CA_41C, CA_66C		
Modulation Type:	☒ QPSK	☒ 16QAM	☒ 64QAM ☒ 256QAM
Antenna Type:	External Antenna		
Antenna Gain:	LTE band 2:	2.14 dBi (declare by Applicant)	
	LTE band 4:	2.64 dBi (declare by Applicant)	
	LTE band 5:	-0.82 dBi (declare by Applicant)	
	LTE band 7:	2.31 dBi (declare by Applicant)	
	LTE band 12:	0.65 dBi (declare by Applicant)	
	LTE band 13:	-0.24 dBi (declare by Applicant)	
	LTE band 14:	-0.24 dBi (declare by Applicant)	
	LTE band 17:	0.65 dBi (declare by Applicant)	
	LTE band 25:	2.14 dBi (declare by Applicant)	
	LTE band 26:	-0.82 dBi (declare by Applicant)	
	LTE band 38:	2.08 dBi (declare by Applicant)	
	LTE band 41:	2.64 dBi (declare by Applicant)	
	LTE band 66:	2.64 dBi (declare by Applicant)	
	LTE band 71:	0.65 dBi (declare by Applicant)	

NR Specification			
Operation Frequency Range:	Band n2:	Tx: 1850 MHz - 1910 MHz	Rx: 1930 MHz - 1990 MHz
	Band n5:	Tx: 824 MHz - 849 MHz	Rx: 869 MHz - 894 MHz
	Band n7:	Tx: 2500 MHz - 2570 MHz	Rx: 2620 MHz - 2690 MHz
	Band n12:	Tx: 699 MHz - 716 MHz	Rx: 729 MHz - 746 MHz
	Band n25:	Tx: 1850 MHz - 1915 MHz	Rx: 1930 MHz - 1995 MHz
	Band n41:	Tx: 2496 MHz - 2690 MHz	Rx: 2496 MHz - 2690 MHz
	Band n66:	Tx: 1710 MHz - 1780 MHz	Rx: 2110 MHz - 2200 MHz
	Band n71:	Tx: 663 MHz - 698 MHz	Rx: 617 MHz - 652 MHz
	Band n77:	Tx: 3700 MHz - 3980 MHz	Rx: 3700 MHz - 3980 MHz
Modulation Type:	☒ DFT-s-OFDM:	Pi/2-BPSK, QPSK, 16-QAM, 64-QAM, 256-QAM	
	☒ CP-OFDM:	QPSK, 16-QAM, 64-QAM, 256-QAM	
Network Mode:	☒ SA:	n2, n5, n7, n12, n25, n66, n71, n77	
	☒ SA UL MIMO:	n41	
	☒ NSA(EN-DC):	DC_5A_n2A, DC_12A_n2, DC_13A_n2A, DC_2A_n5A DC_30A_n5A, DC_66A_n5A, DC_5A_n7A, DC_12A_n7A DC_2A_n12A, DC_12A_n25A, DC_2A_n41A, DC_25A_n41A DC_26A_n41A, DC_66A_n41A, DC_5A_n66A, DC_12A_n66A DC_13A_n66A, DC_14A_n66A, DC_71A_n66A, DC_2A_n71A DC_7A_n71A, DC_66A_n71A	
SCS Support:	FDD Band : 15 kHz, TDD Band : 30 kHz		
HPUE Band:	n41, n77		
Antenna Type:	External Antenna		
Antenna Gain:	Band n2:	2.14 dBi (declare by Applicant)	
	Band n5:	-0.82 dBi (declare by Applicant)	
	Band n7:	2.31 dBi (declare by Applicant)	
	Band n12:	0.65 dBi (declare by Applicant)	
	Band n25:	2.14 dBi (declare by Applicant)	
	Band n41:	2.64 dBi (declare by Applicant)	
	Band n66:	2.64 dBi (declare by Applicant)	
	Band n71:	0.65 dBi (declare by Applicant)	
	Band n77:	4.29 dBi (declare by Applicant)	
Test Sample Condition:	The test samples were provided in good working order with no visible defects.		

3.3 Operating Modes

Operating mode	Detail description
BLE mode	Keep the EUT in continuously transmitting in BLE mode
2.4G WIFI mode	Keep the EUT in continuously transmitting in 2.4G WIFI mode
5.2G WIFI mode	Keep the EUT in continuously transmitting in 5.2G WIFI mode
5.8G WIFI mode	Keep the EUT in continuously transmitting in 5.8G WIFI mode
Lora mode	Keep the EUT in continuously transmitting in Lora mode
WCDMA mode	Keep the EUT in continuously transmitting in WCDMA Band 2/4/5 mode
LTE mode	Keep the EUT in continuously transmitting in LTE Band 2/4/5/7/12/13/14/17/25/26/38/41/66/71 mode
5G NR mode	Keep the EUT in continuously transmitting in 5G NR n2/5/7/12/25/41/66/77/71 mode

3.4 Additions to, deviations, or exclusions from the method

No

3.5 Laboratory Facility

The test facility is recognized, certified, or accredited by the following organizations: ● FCC - Designation No.: CN1211 JianYan Testing Group Shenzhen Co., Ltd. has been accredited as a testing laboratory by FCC(Federal Communications Commission). The test firm Registration No. is 727551. ● ISED – CAB identifier.: CN0021 The 3m Semi-anechoic chamber and 10m Semi-anechoic chamber of JianYan Testing Group Shenzhen Co., Ltd. has been Registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 10106A-1. ● CNAS - Registration No.: CNAS L15527 JianYan Testing Group Shenzhen Co., Ltd. is accredited to ISO/IEC 17025:2017 General Requirements for the Competence of Testing and Calibration laboratories for the competence of testing. The Registration No. is CNAS L15527. ● A2LA - Registration No.: 4346.01 This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 General requirements for the competence of testing and calibration laboratories. The test scope can be found as below link: https://portal.a2la.org/scopepdf/4346-01.pdf
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3.6 Laboratory Location

JianYan Testing Group Shenzhen Co., Ltd. Address: No.101, Building 8, Innovation Wisdom Port, No.155 Hongtian Road, Huangpu Community, Xinqiao Street, Bao'an District, Shenzhen, Guangdong, People's Republic of China. Tel: +86-755-23118282, Fax: +86-755-23116366 Email: info-JYTee@lets.com, Website: http://jyt.lets.com

4 Technical Requirements Specification

4.1 Limits

The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f ²)	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f ²)	30
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

4.2 Test Procedure

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{P \times G}{4 \times \pi \times R^2}$$

Where:

S = power density

P = power input to the antenna

G = numeric gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the centre of radiation of the antenna

4.3 Result

Mode	Maximum Output power (dBm)	Maximum Output power (mW)	Antenna Gain (dBi)	Antenna Gain (numeric)	Distance (cm)	Result (mW/cm ²)	Limits for General Population/ Uncontrolled Exposure (mW/cm ²)
2.4G Wi-Fi							
802.11n20	16.66	46.35	1.61	1.45	20.00	0.0134	1.0000
5.2G Wi-Fi							
802.11n40	17.549	56.87	0.75	1.19	20.00	0.0135	1.0000
5.8G Wi-Fi							
802.11n20	17.787	60.08	0.87	1.22	20.00	0.0146	1.0000
BLE							
BLE 2M	6.246	4.21	1.61	1.45	20.00	0.0012	1.0000
LORA 125KHz							
LORA	12.58	18.11	1.39	1.38	20.00	0.0050	0.6000
LORA 500KHz							
LORA	12.77	18.92	1.31	1.35	20.00	0.0051	0.6000
WCDMA							
Band 2	25.00	316.23	2.14	1.64	20.00	0.1032	1.0000
Band 4	25.00	316.23	2.64	1.84	20.00	0.1158	1.0000
Band 5	25.00	316.23	-0.82	0.83	20.00	0.0500	0.5493
LTE							
Band 2	25.00	316.23	2.14	1.64	20.00	0.1032	1.0000
Band 4	25.00	316.23	2.64	1.84	20.00	0.1158	1.0000
Band 5	25.00	316.23	-0.82	0.83	20.00	0.0522	0.5493
Band 7	25.00	316.23	2.31	1.7	20.00	0.1070	1.0000
Band 12	25.00	316.23	0.65	1.16	20.00	0.0730	0.4660
Band 13	25.00	316.23	-0.24	0.95	20.00	0.0598	0.5180
Band 14	25.00	316.23	-0.24	0.95	20.00	0.0598	0.5253
Band 17	25.00	316.23	0.65	1.16	20.00	0.0700	0.4693
Band 25	25.00	316.23	2.14	1.64	20.00	0.1032	1.0000
Band 26	25.00	316.23	-0.82	0.83	20.00	0.0522	0.5427
Band 38	28.00	630.96	2.08	1.61	20.00	0.2000	1.0000
Band 41	28.00	630.96	2.64	1.84	20.00	0.2311	1.0000
Band 66	25.00	316.23	2.64	1.84	20.00	0.1158	1.0000
Band 71	25.00	316.23	0.65	1.16	20.00	0.0730	0.4420
NR							
n2	25.00	316.23	2.14	1.64	20.00	0.1032	1.0000
n5	25.00	316.23	-0.82	0.83	20.00	0.0522	0.5493
n7	25.00	316.23	2.31	1.7	20.00	0.1070	1.0000
n12	25.00	316.23	0.65	1.16	20.00	0.0730	0.4660
n25	25.00	316.23	2.14	1.64	20.00	0.1000	1.0000
n41	28.00	630.96	2.64	1.84	20.00	0.2311	1.0000
n66	25.00	316.23	2.64	1.84	20.00	0.1158	1.0000
n71	25.00	316.23	0.65	1.16	20.00	0.0730	0.4420
n77	28.00	630.96	4.29	2.69	20.00	0.3378	1.0000

Simultaneous transmission(Worse mode):

ANT No.	Mode	Ratio	Total Ratio	Limit
BLE ANT	BLE	0.0012	0.3621	1.00
Lora ANT	Lora 500KHz	0.0085		
Wi-Fi ANT	5.2GWi-Fi	0.0146		
WCDMA/LTE/NR ANT	5G n77	0.3378		

Note:

1. Just the worst case mode was shown in report.
2. WCDMA/LTE/NR Maximum Output power please refer to FCC ID: XMR2020RM500QAE, report No.: 2011RSU077-U8 . Reports was issued by Hefei Panwin Technology Co., Ltd.
3. 2.4G/5.2G/5.8G Wi-Fi Maximum Output power please refer to FCC ID: 2AL6KBL-M8852BS2, MPE report. Reports was issued by Shenzhen ZKT Technology Co., Ltd.

4.4 Conclusion

The device is exempt from the SAR test and satisfies RF exposure evaluation.

-----End of report-----