

# Ecovacs Home Service Robotics Co., Ltd.

# EMC TEST REPORT

**Report Type:**

FCC Part 15B & ICES-003 EMC report

**Model:**

DEX86

**REPORT NUMBER:**

2310A1462SHA-001

**ISSUE DATE:**

March 5, 2024

**DOCUMENT CONTROL NUMBER:**

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**Applicant:** Ecovacs Home Service Robotics Co., Ltd.  
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**FCC ID:** 2A64B-DEX86

**IC:** 28593-DEX86

### SUMMARY:

The equipment complies with the requirements according to the following standard(s) or Specification:

**47CFR Part 15 (2021):** Radio Frequency Devices (Subpart B)

**ANSI C63.4 (2014):** American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

**ICES-003 Issue 7 October 2020:** Information Technology Equipment (Including Digital Apparatus) —Limits and Methods of Measurement.

### PREPARED BY:



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### REVIEWED BY:



Reviewer  
Wakeyou Wang

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**TEST REPORT**

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## Revision History

Report No.	Version	Description	Issued Date
230302476SHA-005	Rev. 01	Initial issue of report	June 6, 2023
2310A1462SHA-001	Rev. 01	This report is based on the original report 230302476SHA-005 for amendment include the follow changes or/and additions: 1, Added a cooling fan. There is no change for RF part, after the evaluation, we tested the radiated emission below 1GHz.	March 5, 2024

## Measurement result summary

TEST ITEM	FCC REFERENCE	IC REFERENCE	RESULT
Power line conducted emission	15.107	3.2.1	NA
Radiated emission	15.109	3.2.2	Pass

Notes: 1: NA =Not Applicable

2: "\*" means this test is no need and not performed within this report, and the result can refer to the related base report(s).

## 1 GENERAL INFORMATION

### 1.1 Description of Equipment Under Test (EUT)

Product name:	Floor Cleaning Robot
Type/Model:	DEX86
Description of EUT:	The EUT is a Floor Cleaning Robot, it supports WIFI and Bluetooth functions, there is only one model. we test them and list the worst results in this report.
Rating:	20V DC 2.0A
Category of EUT:	Class B
EUT type:	<input type="checkbox"/> Table top <input checked="" type="checkbox"/> Floor standing
Highest operating frequency	< 2480MHz
Software Version:	/
Hardware Version:	/
Sample Identification No.:	0231213-02-001
Sample received date:	2023.12.13
Date of test:	2023.12.15-2023.12.23

## 1.2 Description of Test Facility

Name:	Intertek Testing Services Shanghai
Address:	Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R. China
Telephone:	86 21 61278200
Telefax:	86 21 54262353

The test facility is recognized, certified, or accredited by these organizations:	CNAS Accreditation Lab Registration No. CNAS L0139
	FCC Accredited Lab Designation Number: CN0175
	IC Registration Lab CAB identifier.: CN0014
	VCCI Registration Lab Member No: 3598 (Registration No.: R-14243, G-10845, C-14723, T-12252)
	A2LA Accreditation Lab Certificate Number: 3309.02

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**2 TEST SPECIFICATIONS**

**2.1 Standards or specification**

47CFR Part 15 (2021)  
 ANSI C63.10 (2014)  
 ICES-003 Issue 7 October 2020

**2.2 Mode of operation during the test**

Within this test report, EUT was tested under all available operation modes and tested under its rating voltage and frequency. Other voltage and frequency are specified if used.

**2.3 Test software list**

Test Items	Software	Manufacturer	Version
Radiated emission	ES-K1	R&S	V1.71

**2.4 Test peripherals list**

Item No.	Name	Brand and Model	Description
1			-

**2.5 Test environment condition:**

Test items	Temperature	Humidity
Radiated Emissions	25°C	53% RH

## 2.6 Instrument list

Conducted Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input type="checkbox"/>	Test Receiver	R&S	ESR7	EC 6194	2024-02-08
<input type="checkbox"/>	A.M.N.	R&S	ESH2-Z5	EC 3119	2024-11-09
<input type="checkbox"/>	Attenuator	Hua Xiang	Ts5-10db-6g	EC 6194-1	2024-12-07
<input type="checkbox"/>	A.M.N.	R&S	ENV4200	EC 3558	2024-06-05
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESIB 26	EC 3045	2024-08-22
<input checked="" type="checkbox"/>	Bilog Antenna	TESEQ	CBL 6112B	EC 6411	2024-09-12
<input type="checkbox"/>	Pre-amplifier	R&S	AFS42-00101800-25-S-42	EC5262	2024-06-15
<input type="checkbox"/>	Horn antenna	ETS	3117	EC 4792-1	2024-09-15
<input type="checkbox"/>	Horn antenna	TOYO	HAP18-26W	EC 4792-3	2026-09-12
<input type="checkbox"/>	Active loop antenna	Schwarzbeck	FMZB1519	EC 5345	2024-07-16
Tet Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input type="checkbox"/>	Shielded room	Zhongyu	-	EC 2838	2024-01-11
<input type="checkbox"/>	Shielded room	Zhongyu	-	EC 2839	2024-01-11
<input checked="" type="checkbox"/>	Semi-anechoic chamber	Albatross project	-	EC 3048	2024-07-08
<input type="checkbox"/>	Fully-anechoic chamber	Albatross project	-	EC 3047	2024-07-08
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input type="checkbox"/>	Thermo-Hygrograph	Testo	175h1	EC 6640	2024-08-28
<input type="checkbox"/>	Thermo-Hygrograph	Testo	175h1	EC 6641	2024-08-28
<input checked="" type="checkbox"/>	Thermo-Hygrograph	Testo	175h1	EC6642	2024-08-28
<input checked="" type="checkbox"/>	Thermo-Hygrograph	Testo	175h1	EC 6643	2024-08-28
<input type="checkbox"/>	Thermo-Hygrograph	Testo	175h1	EC 6644	2024-08-28
<input type="checkbox"/>	Pressure meter	YM3	Shanghai Mengde	EC 3320	2024-08-16

**TEST REPORT****2.7 Measurement uncertainty**

The measurement uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

<b>Test item</b>	<b>Measurement uncertainty</b>
Radiated Emissions in restricted frequency bands below 1GHz	$\pm 4.90\text{dB}$
Radiated Emissions in restricted frequency bands above 1GHz	$\pm 5.02\text{dB}$
Power line conducted emission	$\pm 3.19\text{dB}$

### 3 Radiated Emissions

Test result: Pass

#### 3.1 Limit

##### 3.1.1 Limits for radiated disturbance of class A device

FCC

Frequency (MHz)	Permitted limit in dB $\mu$ V/m (Quasi-peak) of Measurement Distance 10m
30 – 88	39
88 – 216	43.5
216 – 960	46.4
Above 960	49.5

Note: for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.

IC

Frequency (MHz)	Permitted limit in dB $\mu$ V/m (Quasi-peak) of Measurement Distance 10m	Permitted limit in dB $\mu$ V/m (Quasi-peak) of Measurement Distance 3m
30 ~ 88	40.0	50.0
88 ~ 216	43.5	54.0
216 ~ 230	46.4	56.9
230 ~ 960	47.0	57.0
960 ~ 1000	49.5	60.0

Note: The more stringent limit applies at transition frequencies.

Frequency (GHz)	Permitted limit in dB $\mu$ V/m (Peak) of Measurement Distance 3m	Permitted limit in dB $\mu$ V/m (Average) of Measurement Distance 3m
1 ~ F <sub>M</sub>	80.0	60.0

Note: These limit levels apply for a measurement distance of 3 m. If using a different measurement distance, the measured levels shall be extrapolated to the 3 m limit distance using a factor of 20 dB per decade of distance. The measurement distance shall place the measurement antenna in the far field of the ITE or digital apparatus under test.

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3.1.2 Limits for radiated disturbance of class B device

FCC

Frequency (MHz)	Permitted limit in dB $\mu$ V/m (Quasi-peak) of Measurement Distance 3m
30 – 88	40.0
88 – 216	43.5
216 – 960	46.0
Above 960	54.0

Note: for the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.

IC

Frequency (MHz)	Permitted limit in dB $\mu$ V/m (Quasi-peak) of Measurement Distance 10m	Permitted limit in dB $\mu$ V/m (Quasi-peak) of Measurement Distance 3m
30 ~ 88	30.0	40.0
88 ~ 216	33.1	43.5
216 ~ 230	35.6	46.0
230 ~ 960	37.0	47.0
960 ~ 1000	43.5	54.0

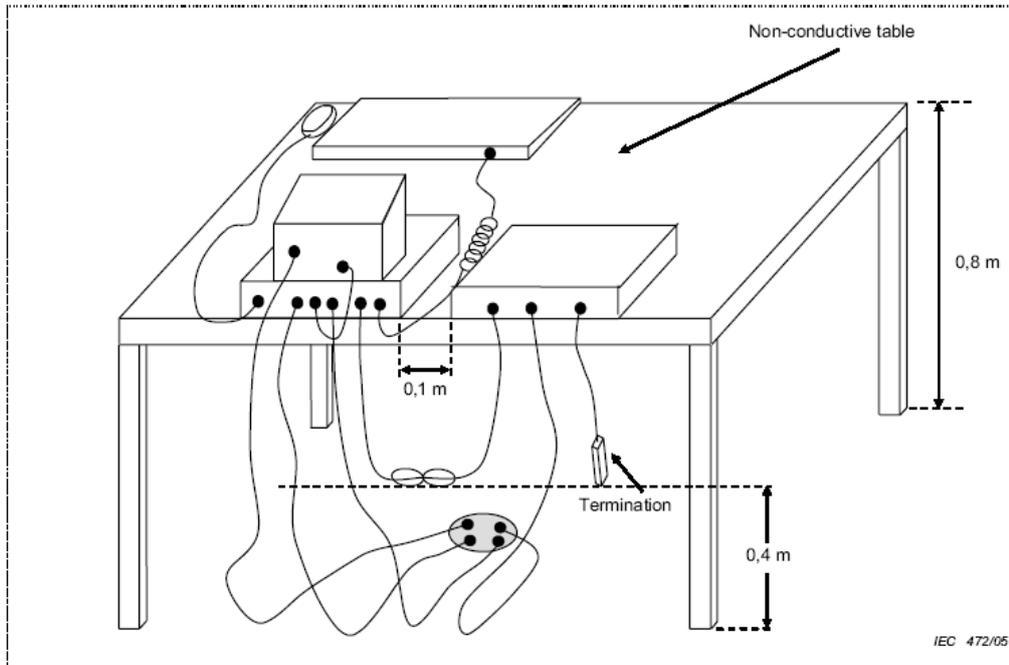
Note: The more stringent limit applies at transition frequencies.

Frequency (GHz)	Permitted limit in dB $\mu$ V/m (Peak) of Measurement Distance 3m	Permitted limit in dB $\mu$ V/m (Average) of Measurement Distance 3m
1 ~ F <sub>M</sub>	74.0	54.0

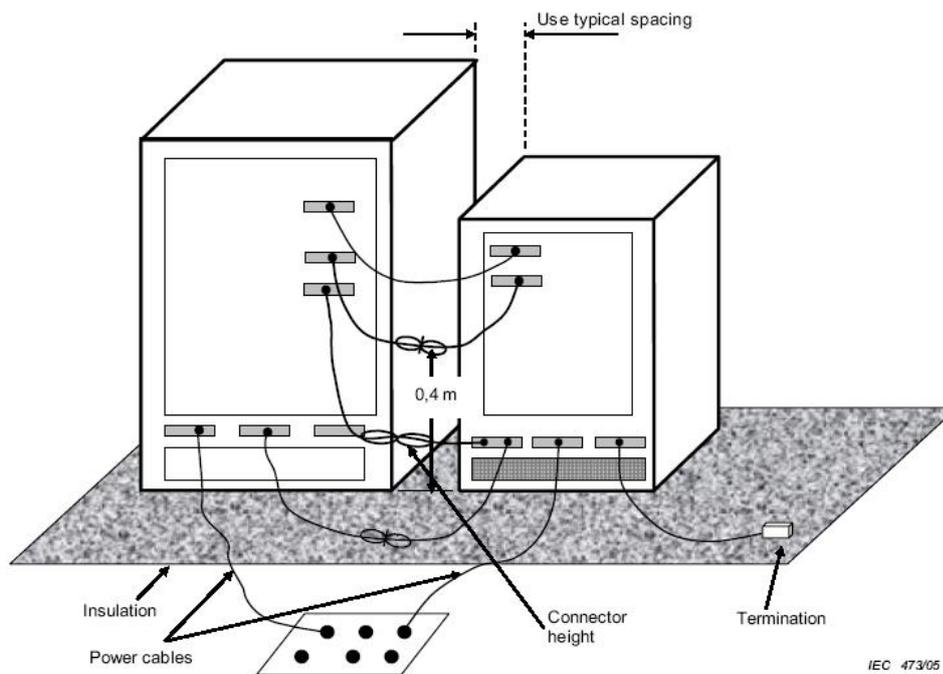
Note: These limit levels apply for a measurement distance of 3 m. If using a different measurement distance, the measured levels shall be extrapolated to the 3 m limit distance using a factor of 20 dB per decade of distance. The measurement distance shall place the measurement antenna in the far field of the ITE or digital apparatus under test.

### 3.2 Block diagram and test set up

For table top equipment



For floor standing equipment



### 3.3 Measurement Procedure

The measurement was performed in a semi-anechoic chamber. While testing for spurious emission higher than 1GHz, the pre-amplifier (and high pass filter if necessary) is equipped just at the output terminal of the antenna.

The distance from EUT to receiving antenna is 3 meters.

Measurement was performed according to clause 4 and clause 5 of ANSI 63.4.

Test procedure was according to clause 8.3 of ANSI 63.4.

EUT arrangement and operate condition were according to clause 6 and clause 8 of ANSI 63.4.

The radiated emission was measured using the test receiver with the resolutions bandwidth set as:

RBW = 100kHz, VBW = 300kHz (30MHz~1GHz)

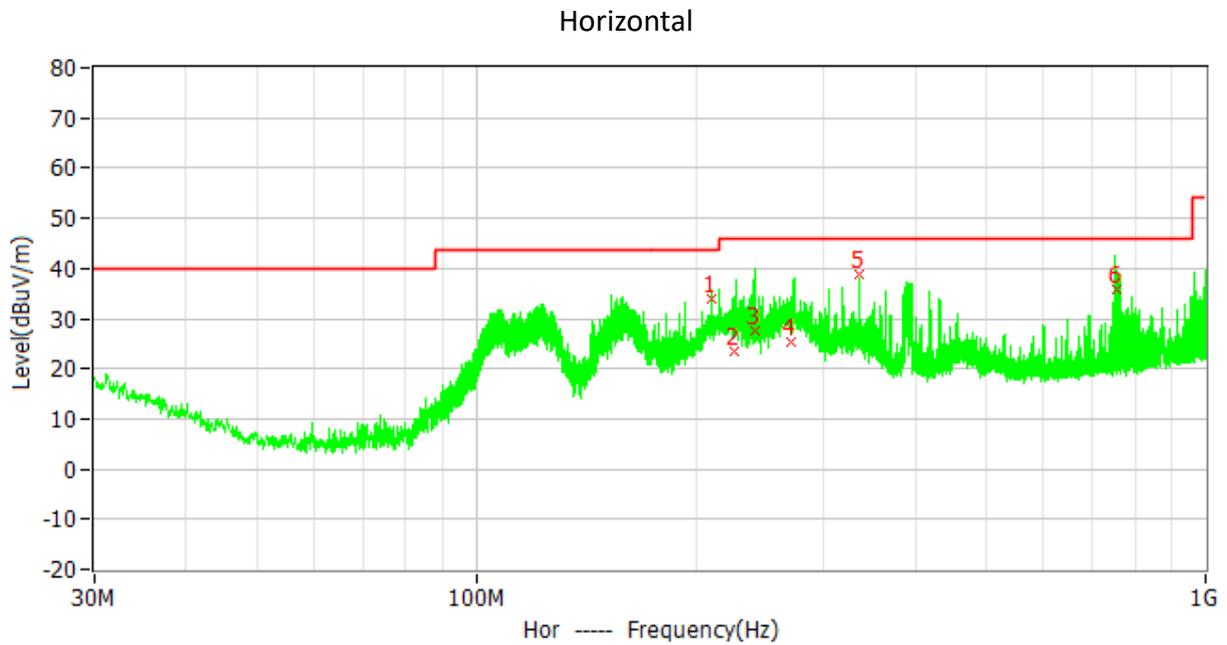
RBW = 1MHz, VBW = 3MHz (>1GHz for PK)

Highest internal frequency (F <sub>x</sub> )	Highest measured frequency F <sub>M</sub> for radiated measurement	Measured Bandwidth
F <sub>x</sub> ≤ 108 MHz	1 GHz	120kHz
108 MHz < F <sub>x</sub> ≤ 500 MHz	2 GHz	1MHz
500 MHz < F <sub>x</sub> ≤ 1 GHz	5 GHz	1MHz
F <sub>x</sub> > 1 GHz	5 × F <sub>x</sub> up to a maximum of 40 GHz	1MHz
Note: 1. F <sub>x</sub> is the highest fundamental frequency generated and/or used in the ITE or digital apparatus under test.		

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**3.4 Test Results of Radiated Emissions**

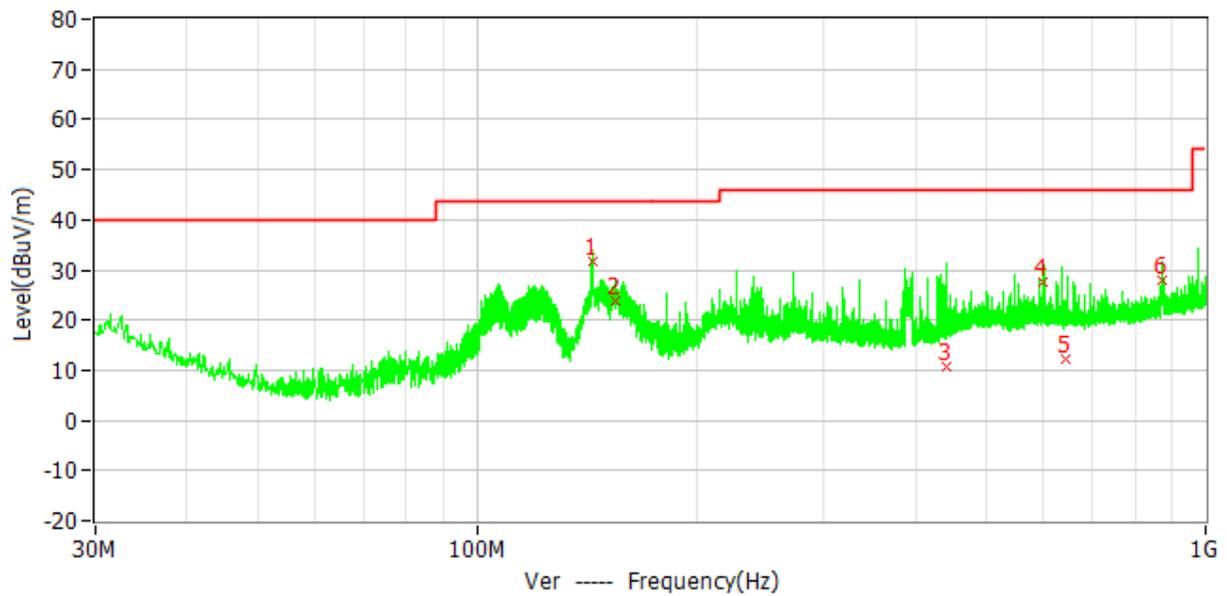
**Test Curve:**



No.	Frequency	Limit dBuV/m	Level dBuV/m	Delta dB	Reading dBuV	Factor dB/m	Detector	Polar
1	210.045MHz	43.5	33.9	-9.6	23.0	10.9	QP	Hor
2	226.108MHz	46.0	23.6	-22.4	12.0	11.6	QP	Hor
3	240.668MHz	46.0	27.6	-18.4	14.4	13.2	QP	Hor
4	270.086MHz	46.0	25.3	-20.7	10.2	15.1	QP	Hor
5	336.015MHz	46.0	38.9	-7.1	22.7	16.2	QP	Hor
6	754.147MHz	46.0	35.9	-10.1	13.6	22.3	QP	Hor

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### Vertical



No.	Frequency	Limit dBuV/m	Level dBuV/m	Delta dB	Reading dBuV	Factor dB/m	Detector	Polar
1	144.001MHz	43.5	31.5	-12.0	19.2	12.3	QP	Ver
2	155.114MHz	43.5	24.0	-19.5	12.3	11.7	QP	Ver
3	440.402MHz	46.0	10.7	-35.3	-8.1	18.8	QP	Ver
4	600.008MHz	46.0	27.6	-18.4	6.3	21.3	QP	Ver
5	641.573MHz	46.0	12.1	-33.9	-9.5	21.6	QP	Ver
6	869.109MHz	46.0	27.9	-18.1	4.2	23.7	QP	Ver

#### Remark:

1. Factor= Antenna Factor + Cable Loss (-Amplifier, is employed)
2. Level= Original Receiver Reading + Factor
3. Delta = Level - Limit
4. If the PK measured level is lower than AV limit, the AV test can be elided.

\*\*\*\*\* END \*\*\*\*\*