

FCC 47 CFR MPE REPORT

WUHU MUCHEN E-COMMERCE CO.,LTD.

Robot Vacuum Cleaner

Model Number: R2

Additional Model: R2Pro, R3, R3Pro

FCC ID: 2AZA3-3Y16X2

Prepared for:	WUHU MUCHEN E-COMMERCE CO.,LTD
	No.080 3rd Floor Complex Block E Nanxiang Wanshang,
	International Trade City Phase I, Wuhu, Anhui, China
Prepared By:	EST Technology Co., Ltd.
	Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China
Tel: 86-769-83081888-808	

Report Number:	ESTE-R2103330
Date of Test:	Jan. 19~Mar. 29, 2021
Date of Report:	Mar. 31, 2021

Maximum Permissible Exposure

1. Applicable Standards

Systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure. In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as a mobile device whereby a distance of 0.2m normally can be maintained between the user and the device.

1.1. Limits for Maximum Permissible Exposure (MPE)

(a) Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-10000			5	6

(b) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Times E ² , H ² or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-10000			1.0	30

Note: f=frequency in MHz; *Plane-wave equivalent power density

1.2. MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric Field (V/m)

P = Peak RF output Power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

From the peak EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained

2. Conducted Power Result

Mode	Frequency (MHz)	Peak output power (dBm)	Peak output power (mW)	Target power (dBm)	Antenna gain	
					(dBi)	(Linear)
IEEE 802.11 b	2402	12.94	19.6789	12±2	1	1.26
	2441	12.54	17.9473	12±2	1	1.26
	2480	11.91	15.5239	11±2	1	1.26
IEEE 802.11 g	2402	17.54	56.7545	17±2	1	1.26
	2441	17.01	50.2343	17±2	1	1.26
	2480	16.36	43.2514	16±2	1	1.26
IEEE 802.11 n HT20	2402	17.48	55.9758	17±2	1	1.26
	2440	16.90	48.9779	16±2	1	1.26
	2480	16.35	43.1519	16±2	1	1.26

3. Calculated Result and Limit

Mode	Target power (dBm)	Antenna gain		Power Density (S) (mW/cm ²)	Limited of Power Density (S) (mW/cm ²)	Test Result
		(dBi)	(Linear)			
2.4G Band						
IEEE 802.11 b	14	1	1.26	0.0063	1	Complies
IEEE 802.11 g	19	1	1.26	0.0199	1	Complies
IEEE 802.11 n HT20	19	1	1.26	0.0199	1	Complies

End of Test Report