

FCC 47 CFR MPE REPORT

TZUMI Electronics,LLC

ionvac UltraClean UV sanitizing robo vac (Robotic Vacuum Cleaner)

Model Number: 7688

Additional Model: 7688WM

FCC ID: 2AON7-WJ7688TZUMI

Prepared for:	TZUMI Electronics,LLC
	16 EAST 34TH STREET 16TH FLOOR, New York 10016, United States
Prepared By:	EST Technology Co., Ltd.
	Chilingxiang, Qishantou, Santun, Houjie, Dongguan, Guangdong, China
Tel: 86-769-83081888-808	

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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, $d=0.2\text{m}$, 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 802.11b	2412	13.00	19.953	13±1	2.5	1.778
	2437	12.92	19.588	12±1	2.5	1.778
	2462	12.89	19.454	12±1	2.5	1.778
IEEE 802.11g	2412	15.03	31.842	15±1	2.5	1.778
	2437	15.08	32.211	15±1	2.5	1.778
	2462	15.15	32.734	15±1	2.5	1.778
IEEE 802.11n HT20	2412	15.11	32.434	15±1	2.5	1.778
	2437	15.25	33.497	15±1	2.5	1.778
	2462	15.29	33.806	15±1	2.5	1.778
IEEE 802.11n HT40	2422	13.95	24.831	13±1	2.5	1.778
	2437	14.07	25.527	14±1	2.5	1.778
	2452	14.17	26.122	14±1	2.5	1.778

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)			
IEEE 802.11b	14	2.5	1.778	0.00889	1	Compiles
IEEE 802.11g	16	2.5	1.778	0.01408	1	Compiles
IEEE 802.11n HT20	16	2.5	1.778	0.01408	1	Compiles
IEEE 802.11n HT40	15	2.5	1.778	0.01119	1	Compiles

End of Test Report