FCC RF Exposure Evaluation

1. Product Information

FCC ID	2AYOV-V100
Product name	Robot Vacuum Cleaner
Model number	V106
Additional Model	V100, V101, V102, V103, V105, V107, V108, V109, V110, V111, V112, V115, V116, V117, V118, V119, V120, V121, V122, V125, V126, V127, V128, V100 Pro, V101 Pro, V102 Pro, V103 Pro, V105 Pro, V106 Pro, V107 Pro, V108 Pro, V109 Pro, V110 Pro, V111 Pro, V112 Pro, V115 Pro, V116 Pro, V117 Pro, V118 Pro, V119 Pro, V120 Pro, V121 Pro, V122 Pro, V125 Pro, V126 Pro, V127 Pro, V128 Pro, V100 Plus, V101 Plus, V102 Plus, V103 Plus, V105 Plus, V106 Plus, V107 Plus, V108 Plus, V109 Plus, V110 Plus, V111 Plus, V112 Plus, V115 Plus, V116 Plus, V117 Plus, V118 Plus, V119 Plus, V120 Plus, V121 Plus, V122 Plus, V125 Plus, V126 Plus, V127 Plus, V128 Plus
Model Declaration	PCB board, structure and internal of these model(s) are the same, So no additional models were tested
Power supply	Battery 1: DC 14.8V by Rechargeable Li-ion Battery (3000mAh) Battery 2: DC 14.4V by Rechargeable Li-ion Battery (2550mAh) Battery 3: DC 14.4V by Rechargeable Li-ion Battery (2500mAh) Battery 4: DC 14.4V by Rechargeable Li-ion Battery (3000mAh) Adapter1: Input: 100-240V~, 50/60Hz, 0.5A Max Output: 19V⎓0.6A Adapter2: Input: 100-240V~, 50/60Hz 0.6A Output: 19V⎓1A Adapter3: Input: 100-240V~, 50/60Hz 0.8A MAX Output: 19V⎓1000mA Adapter4: Input: 100-240V~, 50/60Hz, 0.4A Max Output: 19V⎓600mA Adapter5:CZH015190060TRWM Input:100-240V~, 50/60Hz,0.5A MAX Output:19V,0.6A,11.4W Adapter6:CZH024190100TRWO Input:100-240V~, 50/60Hz,0.8A MAX Output:19V,1.0A,19.0W Adapter7:FX24U-190100K Input:100-240V~,50/60Hz,0.6A MAX Output:19V,1A Adapter8:FX18U-190060K Input:100-240V~,50/60Hz,0.5A MAX Output:19V,0.6A Adapter9:SK03T-1900100Z Input:100-240V~, 50/60Hz,0.6A MAX Output:19.0V,1.0A,19.0W
Hardware version	V1.0.0
Software version	V1.0.0
FCC Operation frequency	2412MHz-2462MHz
Channel Number	11 Channels for 20MHz bandwidth (2412~2462MHz) 7 Channels for 40MHz bandwidth (2422~2452MHz)
Modulation Type	IEEE 802.11b: DSSS (CCK, DQPSK, DBPSK)

	IEEE 802.11g: OFDM (64QAM, 16QAM, QPSK, BPSK)
	IEEE 802.11n: OFDM (64QAM, 16QAM,QPSK,BPSK)
Antenna Type	PCB Antenna
Antenna Gain	0dBi(Max.)
Exposure category	General population/uncontrolled environment
EUT Type	Production Unit
Device Type	Mobile Devices

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Page 2 of 5

2. Evaluation Method

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

In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modelled or measured field strengths or power density, is ≤ 1.0. The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

3. Limit

3. 1 Refer Evaluation Method

ANSI C95.1–1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.
FCC KDB publication 447498 D01 General 1 RF Exposure Guidance v06: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.
FCC CFR 47 part1 1.1310: Radiofrequency radiation exposure limits.
FCC CFR 47 part2 2.1091: Radiofrequency radiation exposure evaluation: mobile devices

3. 2 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
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
Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure				
Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 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

F=frequency in MHz
*=Plane-wave equivalent power density

4. MPE Calculation Method

Predication of MPE limit at a given distance
Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S=PG/4\pi R^2$$

Where: S=power density
P=power input to antenna
G=power gain of the antenna in the direction of interest relative to an isotropic radiator
R=distance to the center of radiation of the antenna

5. Antenna Information

Artemis Antenna can only use antennas certificated as follows provided by manufacturer;

Internal Identification	Antenna type and antenna number	Operate frequency band	Maximum antenna gain	Note
Antenna	PCB Antenna	2400MHz-2500MHz	0dBi	WIFI Antenna

6. Conducted Power

<2.4GWLAN Max Conducted Power >

Mode	Channel	Frequency(MHz)	Max Conducted Power (dBm)
IEEE 802.11b	1	2412	16.93
	6	2437	17.62
	11	2462	17.10
IEEE 802.11g	1	2412	17.96
	6	2437	17.90
	11	2462	17.40
IEEE 802.11n HT20	1	2412	16.95
	6	2437	18.24
	11	2462	17.44
IEEE 802.11n HT40	3	2422	15.85
	6	2437	16.37
	9	2452	16.15

7. Manufacturing Tolerance

<2.4G WIFI>

11B (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	16.0	17.0	17.0
Tolerance ±(dB)	1.0	1.0	1.0
11G (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	17.0	17.0	17.0
Tolerance ±(dB)	1.0	1.0	1.0
11N20SISO (Peak)			
Channel	Channel 1	Channel 6	Channel 11
Target (dBm)	16.0	18.0	17.0
Tolerance ±(dB)	1.0	1.0	1.0
11N40SISO (Peak)			
Channel	Channel 3	Channel 6	Channel 9
Target (dBm)	15.0	16.0	16.0
Tolerance ±(dB)	1.0	1.0	1.0

8. Measurement Results

8.1 Standalone MPE

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, r =20cm, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

<2.4G WIFI>

Band/Mode	RF output power		Antenna Gain (dBi)	MPE (mW/cm2)	MPE Limits (mW/cm2)
	dBm	mW			
IEEE 802.11b	18.0	63.0957	0	0.0126	1.0000
IEEE 802.11g	18.0	63.0957	0	0.0126	1.0000
IEEE 802.11n HT20	19.0	79.4328	0	0.0158	1.0000
IEEE 802.11n HT40	17.0	50.1187	0	0.0100	1.0000

Remark:
1. Output power including tune-up tolerance;
2. MPE evaluate distance is 20cm from user manual provide by manufacturer;

8.2 Simultaneous Transmission MPE

9. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

......................THE END OF REPORT........................