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RF Exposure evaluation

Report Reference No.: CTL2509108021-WFH

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Product Name: CORDLESS ROBOTIC POOL CLEANER

Model/Type reference: PRN30-D

List Model(s): PRN31

Trade Mark: Aiper

FCC ID: 2BD5N-PRN30

Applicant's name: Shenzhen Aiper Intelligent Co.,Ltd.

Address of applicant: 32nd floor, Block C, Phase 2 Galaxy World, Minle community,
Minzhi street, Longhua district, Shenzhen, China

Test Firm: Shenzhen CTL Testing Technology Co., Ltd.

Address of Test Firm: Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road,
Nanshan District, Shenzhen, China 518055

Test specification:

47CFR §1.1310

Standard:

47CFR §2.1091

KDB447498 D01 General RF Exposure Guidance v06

TRF Originator: Shenzhen CTL Testing Technology Co., Ltd.

Master TRF: Dated 2017-01

Date of receipt of test item: October 13, 2025

Date of Test: October 13, 2025-December 24, 2025

Date of Issue: December 25, 2025

Result: Pass

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TEST REPORT

Test Report No. :	CTL2509108021-WFH	December 25, 2025
		Date of issue

Product Name : CORDLESS ROBOTIC POOL CLEANER

Sample No : CTL250910802001

Model /Type : PRN30-D

Listed Models : PRN31

Applicant : **Shenzhen Aiper Intelligent Co.,Ltd.**

Address : 32nd floor, Block C, Phase 2 Galaxy World, Minle community, Minzhi street, Longhua district, Shenzhen, China

Manufacturer : **Shenzhen Aiper Intelligent Co.,Ltd.**

Address : 32nd floor, Block C, Phase 2 Galaxy World, Minle community, Minzhi street, Longhua district, Shenzhen, China

The test results presented in this report relate only to the object tested.

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1 GENERAL INFORMATION

1.1 Environmental conditions

During the measurement the environmental conditions were within the listed ranges:

Normal Temperature:	25°C -35°C
Relative Humidity:	35%-55 %
Air Pressure:	101 KPa

1.2 Product Description

Product Name:	CORDLESS ROBOTIC POOL CLEANER
Model/Type reference:	PRN30-D
Power supply:	DC 14.4V from battery, charged by Charging base from AC adapter
Adapter information 1	Model: GC44-168260-1C Input: 100-240V~50/60Hz 1.5A Output: 16.8V --- 2.6A 43.68W
Adapter information 2	Model: GQ65-168260-AUO Input: 100-240V~50/60Hz 1.5A Output: 16.8V --- 2.6A 43.68W

Bluetooth Low Energy

Supported type:	Bluetooth Low Energy
Modulation:	GFSK
Operation frequency:	2402MHz to 2480MHz
Channel number:	40
Channel separation:	2MHz
Antenna type:	FPC Antenna
Antenna gain:	2.9dBi

2.4G Wi-Fi

Supported type:	IEEE 802.11 b/g/n/ax
Modulation:	IEEE 802.11 b: DSSS IEEE 802.11 g/IEEE 802.11 n(HT20)/IEEE 802.11 n(HT40)/IEEE 802.11ax(HEW20)
Operation frequency:	IEEE 802.11 b/IEEE 802.11 g/IEEE 802.11 n(HT20)/IEEE 802.11ax(HEW20): 2412MHz~2462MHz IEEE 802.11 n(HT40):: 2422MHz~2452MHz
Channel number:	IEEE 802.11 b/IEEE 802.11 g/IEEE 802.11 n(HT20)/IEEE 802.11ax(HEW20): 11 IEEE 802.11 n(HT40): 7
Channel separation:	5MHz
Antenna type:	FPC Antenna
Antenna gain:	2.9dBi

WIFI 5GHz

	20MHz system	40MHz system	80MHz system
Supported type:	802.11a	802.11n	N/A

	802.11n 802.11ac 802.11ax	802.11ac 802.11ax	
Operation frequency:	5180-5240MHz 5260-5320MHz 5500-5700MHz 5745-5825MHz	5190-5230MHz 5270-5310MHz 5510-5670MHz 5755-5795MHz	N/A
Modulation:	OFDM, OFDMA	OFDM, OFDMA	N/A
Channel number:	24	11	N/A
Channel separation:	20MHz	40MHz	N/A
MIMO:	Not Support		
DFS Operational mode:	Support		
Antenna type:	Antenna:FPC Antenna		
Antenna gain:	5180MHz-5240MHz: Antenna:2.68dBi 5260MHz-5320MHz: Antenna:3.22dBi 5500MHz-5700MHz: Antenna:3.63dBi 5745MHz-5825MHz: Antenna:3.46dBi		

Note 1: For more details, refer to the user's manual of the EUT.

Note 2: Antenna gain and cable loss provided by the applicant.

1.3 Test Facility

1.3.1 Address of the test laboratory

Shenzhen CTL Testing Technology Co., Ltd.

Floor 1-A, Baisha Technology Park, No.3011, Shahexi Road, Nanshan District, Shenzhen, China 518055

There is one 3m semi-anechoic chamber and two line conducted labs for final test. The Test Sites meet the requirements in documents ANSI C63.4 and CISPR 32/EN 55032 requirements.

1.3.2 Laboratory accreditation

The test facility is recognized, certified, or accredited by the following organizations:

CNAS-Lab Code: L7497

Shenzhen CTL Testing Technology Co., Ltd. has been assessed and proved to be in compliance with CNAS-CL01 Accreditation Criteria for Testing and Calibration Laboratories (identical to ISO/IEC 17025: 2017 General Requirements) for the Competence of Testing and Calibration Laboratories.

A2LA-Lab Cert. No. 4343.01

Shenzhen CTL Testing Technology Co., Ltd, EMC Laboratory has been accredited by A2LA for technical competence in the field of electrical testing, and proved to be in compliance with ISO/IEC 17025: 2017 General Requirements for the Competence of Testing and Calibration Laboratories and any additional program requirements in the identified field of testing.

IC Registration No.: 9618B

CAB identifier: CN0041

The 3m alternate test site of Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered by Innovation, Science and Economic Development Canada to test to Canadian radio equipment requirements with Registration No.: 9618B.

FCC-Registration No.: 399832

Designation No.: CN1216

Shenzhen CTL Testing Technology Co., Ltd. EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in our files. Registration 399832.

1.4 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report acc. to CISPR 16-4 Specification for radio disturbance and immunity measuring apparatus and methods – Part 4: Uncertainty in EMC Measurements“ and is documented in the Shenzhen CTL Testing Technology Co., Ltd. quality system acc. to DIN EN ISO/IEC 17025. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device.

Hereafter the best measurement capability for CTL laboratory is reported:

Test Items	Measurement Uncertainty	Notes
Transmitter power conducted	± 1.18 dB	(1)

Note 1: This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of $k=1.96$.

2 METHOD OF MEASUREMENT

2.1 Applicable Standard

[ANSI C95.1-2019](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

[FCC KDB447498 D01 General RF Exposure Guidance v06](#): Mobile and Portable Device, RF Exposure, Equipment Authorization Procedures.

[FCC CFR 47 part1 1.1310](#): Radiofrequency radiation exposure limits.

[FCC CFR 47 part2 2.1091](#): Radiofrequency radiation exposure evaluation: mobile devices

2.2 Evaluation Method and 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/cm ²)	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/cm ²)	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

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

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 Conducted Power Results

Bluetooth Low Energy

Mode	Frequency (MHz)	Peak Conducted Output Power (dBm)
1M	2402	-4.08
	2440	-6.10
	2480	-3.58
2M	2402	-3.91
	2440	-5.87
	2480	-3.37

2.4G Wi-Fi

Mode	Frequency (MHz)	Peak Conducted Output Power (dBm)
802.11b	2412	13.83
	2437	13.93
	2462	13.40
802.11g	2412	13.86
	2437	14.02
	2462	13.47
802.11n (HT20)	2412	13.70
	2437	13.84
	2462	13.28
802.11n (HT40)	2422	13.80
	2437	13.98
	2452	13.86
802.11ax (HEW20)	2412	14.35
	2437	14.60
	2462	14.01

5G Wi-Fi Band 1

Mode	Frequency (MHz)	Maximum Average Conducted Output Power (dBm)
802.11a	5180	13.68
	5200	13.71
	5240	12.41
802.11n (HT20)	5180	12.30
	5200	12.18
	5240	12.58
802.11n (HT40)	5190	12.83
	5230	12.37
802.11ac (VHT20)	5180	13.65
	5200	13.59
	5240	12.31
802.11ax (HEW20)	5180	13.49
	5200	13.50
	5240	12.13

5G Wi-Fi Band 2A

Mode	Frequency (MHz)	Maximum Average Conducted Output Power (dBm)
802.11a	5260	12.47
	5300	11.91
	5320	12.46
802.11n (HT20)	5260	13.08
	5300	12.51
	5320	12.87
802.11n (HT40)	5270	10.81
	5310	10.58
802.11ac (VHT20)	5260	12.75
	5300	12.45
	5320	12.86
802.11ax (HEW20)	5260	12.68
	5300	12.21
	5320	12.58

5G Wi-Fi Band 2C

Mode	Frequency (MHz)	Maximum Average Conducted Output Power (dBm)
802.11a	5500	13.14
	5580	12.81
	5700	13.79
802.11n (HT20)	5500	12.89
	5580	12.74
	5700	13.69
802.11n (HT40)	5510	12.86
	5550	12.83
	5670	14.26
802.11ac (VHT20)	5500	12.93
	5580	12.55
	5700	13.59
802.11ax (HEW20)	5500	12.88
	5580	12.45
	5700	13.43

5G Wi-Fi Band 3

Mode	Frequency (MHz)	Maximum Average Conducted Output Power (dBm)
802.11a	5745	13.63
	5785	13.07
	5825	13.49
802.11n (HT20)	5745	13.41
	5785	12.87
	5825	13.22

802.11n (HT40)	5755	12.51
	5795	12.33
802.11ac (VHT20)	5745	13.61
	5785	12.98
	5825	13.31
802.11ax (HEW20)	5745	13.58
	5785	12.95
	5825	13.30

4 Manufacturing Tolerance

Note: Tolerance $\pm$ (dB):1.0

Bluetooth Low Energy

Mode	Frequency (MHz)	Peak Conducted Output Power (dBm)
1M	2402	-5
	2440	-7
	2480	-4
2M	2402	-4
	2440	-6
	2480	-4

2.4G Wi-Fi

Mode	Frequency (MHz)	Peak Conducted Output Power (dBm)
802.11b	2412	13
	2437	13
	2462	13
802.11g	2412	13
	2437	14
	2462	13
802.11n (HT20)	2412	13
	2437	13
	2462	13
802.11n (HT40)	2422	13
	2437	13
	2452	13
802.11ax (HEW20)	2412	14
	2437	14
	2462	14

5G Wi-Fi Band 1

Mode	Frequency (MHz)	Maximum Average Conducted Output Power (dBm)
802.11a	5180	13
	5200	13
	5240	12
802.11n (HT20)	5180	12
	5200	12
	5240	12
802.11n (HT40)	5190	12
	5230	12
802.11ac (VHT20)	5180	13
	5200	13
	5240	12
802.11ax (HEW20)	5180	13
	5200	13
	5240	12

5G Wi-Fi Band 2A

Mode	Frequency (MHz)	Maximum Average Conducted Output Power (dBm)
802.11a	5260	12
	5300	11
	5320	12
802.11n (HT20)	5260	13
	5300	12
	5320	12
802.11n (HT40)	5270	10
	5310	10
802.11ac (VHT20)	5260	12
	5300	12
	5320	12
802.11ax (HEW20)	5260	12
	5300	12
	5320	12

5G Wi-Fi Band 2C

Mode	Frequency (MHz)	Maximum Average Conducted Output Power (dBm)
802.11a	5500	13
	5580	12
	5700	13
802.11n (HT20)	5500	12
	5580	12
	5700	13
802.11n (HT40)	5510	12
	5550	12
	5670	14
802.11ac (VHT20)	5500	12
	5580	12
	5700	13
802.11ax (HEW20)	5500	12
	5580	12
	5700	13

5G Wi-Fi Band 3

Mode	Frequency (MHz)	Maximum Average Conducted Output Power (dBm)
802.11a	5745	13
	5785	13
	5825	13
802.11n (HT20)	5745	13
	5785	12
	5825	13

802.11n (HT40)	5755	12
	5795	12
802.11ac (VHT20)	5745	13
	5785	12
	5825	13
802.11ax (HEW20)	5745	13
	5785	12
	5825	13

5 Evaluation Results

5.1 Standalone Evaluation

f (GHz)	Antenna Distance (cm)	RF output power		G (Num.)	MPE (mW/cm ²)	MPE Limit (mW/cm ²)
		dBm	mW			
2.44	20	-3	0.5012	1.9498	0.0002	1.0000
2.437	20	15	31.6228	1.9498	0.0123	1.0000
5.2	20	14	25.1189	1.8535	0.0093	1.0000
5.26	20	14	25.1189	2.0989	0.0105	1.0000
5.67	20	15	31.6228	2.3067	0.0145	1.0000
5.745	20	14	25.1189	2.2182	0.0111	1.0000

Remark:

1. Output power including tune up tolerance;
2. When the minimum test separation distance is ≥ 20 cm, In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091

6 Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure and SAR Exclusion Threshold per KDB447498 D01 General RF Exposure Guidance v06, No SAR is required.

*****THE END*****