Prüfbericht-Nr.: *Test Report No.:*	**CN24R323 001**	**Auftrags-Nr.:** *Order No.:*	**326058465**	**Seite 1 von 35** *Page 1 of 35*
Kunden-Referenz-Nr.: *Client Reference No.:*	**2486580**	**Auftragsdatum:** *Order date.:*	**2024-10-21**	
Auftraggeber: *Client:*	**Shenzhen Aiper Intelligent Co., Ltd.** Units 3201, 3203A and 3205, 32nd Floor, Block C, Phase 2 Galaxy World, Minle Community, Minzhi Street, Longhua District, Shenzhen, Guangdong, P.R. China			
Prüfgegenstand: *Test item:*	**CORDLESS ROBOTIC POOL CLEANER**			
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	**PRX9**			
Auftrags-Inhalt: *Order content:*	**TÜV Rheinland EMC service**			
Prüfgrundlage: *Test specification:*	**EN 301 489-1 V2.2.3:2019** **EN 301 489-17 V3.2.4:2020**	**EN 301 489-3 V2.3.2:2023**		
Wareneingangsdatum: *Date of receipt:*	**2024-11-12**			
Prüfmuster-Nr.: *Test sample No.:*	**A003855211-001** **A003855213-001**			
Prüfzeitraum: *Testing period:*	**Refer to test report**			
Ort der Prüfung: *Place of testing:*	**Refer to clause 1.1**			
Prüflaboratorium: *Testing laboratory:*	**TÜV Rheinland (Shanghai) Co., Ltd.**			
Prüfergebnis*: *Test result*:*	**Pass**			

geprüft von: / *tested by:*

Lei Wang Jacky Chen

Datum: / *Date:* 2024-12-30

Stellung: / *Position:* Project engineer

genehmigt von: / *authorized by:*

Jessie Xu

Datum: / *Date:* 2024-12-30

Stellung: / *Position:* Authorizer

Sonstiges / *Other:*	Refer to clause 2.2 for more information.

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery:* **Prüfmuster vollständig und unbeschädigt** *Test item complete and undamaged*

* Legende: P(ass) = entspricht o.g. Prüfgrundlage(n) F(ail) = entspricht nicht o.g. Prüfgrundlage(n) N/A = nicht anwendbar N/T = nicht getestet
Legend: P(ass) = passed a.m. test specifications(s) F(ail) = failed a.m. test specifications(s) N/A = not applicable N/T = not tested

Prüfbericht - Nr.: CN24R323 001

Test Report No.:

Anmerkungen
Remarks

1	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibrierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. *The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system.* *Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.*
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3	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. *Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report.* *Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.*
4	Die Entscheidungsregel für Konformitätserklärungen basierend auf numerischen Messergebnisen in diesem Prüfbericht basiert auf der "Null-Grenzwert-Regel" und der "Einfachen Akzeptanz" gemäß ILAC G8:2019 und IEC Guide 115:2021, es sei denn, in der auf Seite 1 dieses Berichts genannten angewandten Norm ist etwas anderes festgelegt oder vom Kunden gewünscht. Dies bedeutet, dass die Messunsicherheit nicht berücksichtigt wird und daher auch nicht im Prüfbericht angegeben wird. Zu weiteren Informationen bezueglich des Risikos durch diese Entscheidungsregel siehe ILAC G8:2019. *The decision rule for statements of conformity, based on numerical measurement results, in this test report is based on the "Zero Guard Band Rule" and "Simple Acceptance" in accordance with ILAC G8:2019 and IEC Guide 115:2021, unless otherwise specified in the applied standard mentioned on Page 1 of this report or requested by the customer. This means that measurement uncertainty is not taken in account and hence also not declared in the test report. For additional information to the resulting risk based of this decision rule please refer to ILAC G8:2019.*

Revision history of test report:

Report number	Issue date	Contents and reason for change if appropriate
CN24R323 001	2024-12-30	Initial release.

Contents

1 Test Sites

1.1 Test Facilities

Laboratory: TÜV Rheinland (Suzhou) Co., Ltd.
Address: No.14 building and north half of No.10 workshop building, No.525, Yuewang Lingang South Road, Pingqian (Taicang) Modern Industrial Park, Shaxi Town, Taicang City, Jiangsu Province, China

The used test equipment is in accordance with CISPR 16-1 series standards for measurement of radio interference.

Refer to Clause 8 for test and measurement instruments.

2 General Product Information

2.1 Product Function and Intended Use

The EUT (equipment under test) is an ordinary cordless robotic pool cleaner for household and similar use. For the further information, refer to the user's manual.

2.2 Ratings and System Details

The cordless robotic pool cleaner consists of a cordless robotic pool cleaner, wireless charging dock and rechargeable lithium-ion battery.

Product	:	Cordless Robotic Pool Cleaner
Model	:	PRX9
System input voltage	:	DC 29.4 V (Li-ion Battery)
Protection class	:	Class III
Technical Specification of 2.4 GHz Wi-Fi, BT and BLE		
Wireless Module	:	AP6212
Frequency Range	:	2400~2483.5 MHz
Modulation Type	:	Wi-Fi: 802.11b: DSSS (CCK, DQPSK, DBPSK) 802.11g/n-HT20: OFDM (QPSK/BPSK/16QAM/64QAM) BT: BDR: GFSK EDR: π/4 -DQPSK, 8DQPSK BLE: GFSK
Antenna Gain	:	3.02 dBi (Provided by the Client)
Receiver Category	:	1
Technical Specification of 2.4 GHz SRD		
Wireless Module	:	XN297L
Frequency Range	:	2478 MHz
Modulation Type	:	FSK
Antenna Gain	:	-6.78 dBi (Provided by the Client)
Receiver Category	:	1

Product	:	Wireless Charging Dock
Model	:	CHW1
Rated input	:	DC 29.4 V, 3 A (powered by battery charger)
Rated output	:	DC 29.4 V, 2.2 A
Protection class	:	Class III
Technical Specification of 2.4 GHz SRD		
Frequency Range	:	2478MHz
Modulation Type	:	FSK
Antenna Gain	:	-6.78 dBi (Provided by the Client)
Receiver Category	:	1

Product	:	Battery Charger
Model	:	GM95-294300-2FGN
Rated input	:	AC 100-240 V, 50/60 Hz, 2.5 A
Rated output	:	DC 29.4 V, 3 A
Protection class	:	Class I

Product	:	Rechargeable Lithium-ion Battery
Model	:	C1264B4-04
Operation voltage	:	DC 25.2 V
Protection class	:	Class III

2.3 Independent Operation Modes

The basic operation modes are:
"On"
- Radio standby
- Transmitting and receive simultaneously

"Off"

2.4 Noise Generating and Noise Suppressing Parts

Refer to the circuit diagram for further information.

2.5 Submitted Documents

Label, user manual and circuit diagram.

3 Test Set-up and Operation Modes

3.1 Principle of Configuration Selection

Emission: The equipment under test (EUT) was configured to measure its highest possible emission level. The test conditions were adapted accordingly in reference to the instructions for use.

Refer to the related paragraph of this report.

Immunity: The equipment under test (EUT) was configured to have its highest possible susceptibility against the tested phenomena. The test conditions were adapted accordingly in reference to the instructions for use.

Refer to the related paragraph of this report.

3.2 Physical Configuration for Testing

Refer to the related paragraph of this report.

3.3 Test Operation and Test Software

During the tests, the APP “Aiper” was used.

3.4 Special Accessories and Auxiliary Equipment

During the tests, the mobile phone (Brand: HUAWEI, model: Mate 10 Pro) was used.

3.5 Countermeasures to achieve EMC Compliance

No other special measure is employed to achieve the requirement.

4 Conformity Decision Rule

For all EMI tests (when included in this report), as measurement uncertainties are less than the values U_{CISPR} given in CISPR 16-4-2, compliance with the limits is determined by comparing measurement results directly with corresponding limits without taking into consideration of measurement uncertainties. For all EMS tests (when included in this report), measurement uncertainties are not considered as well according to corresponding test standards.

5 Test Results EMISSION

5.1 Emission in the Frequency Range up to 30 MHz

5.1.1 Harmonics on AC Mains

Result:	**Passed**

Date of testing : 2024-11-19
Test procedure : EN IEC 61000-3-2:2019+A1
Test duration : 2.5 min
Harmonic order : 2 – 40th
Frequency range : 0 – 2 kHz
Ambient condition : Temperature: 23.5 ºC; Relative humidity: 48.1 %
Test condition : Robot worked on charging mode by charging station

Following are the measurement results, which were obtained via an automatic measurement system.

Table 1: **Harmonic currents measurement result**

Equipment category: Class A; Test voltage: AC 230.09 V, 50 Hz
Fundamental current I: 0.380 A; Power factor: 0.492; Active input power: 84.2 W.

Harmonic order	Result (avg.) (A)	100% limit (A)	Result (max.) (A)	150% limit (A)	Result
2	0.002	1.080	0.003	1.620	Pass
3	0.355	2.300	0.358	3.450	Pass
4	0.002	0.430	0.002	0.645	Pass
5	0.329	1.140	0.332	1.710	Pass
6	0.001	0.300	0.002	0.450	Pass
7	0.292	0.770	0.297	1.155	Pass
8	0.001	0.230	0.002	0.345	Pass
9	0.248	0.400	0.256	0.600	Pass
10	0.001	0.184	0.002	0.276	Pass
11	0.201	0.330	0.210	0.495	Pass
12	0.001	0.153	0.002	0.230	Pass
13	0.153	0.210	0.164	0.315	Pass
14	0.001	0.131	0.002	0.197	Pass
15	0.110	0.150	0.121	0.225	Pass
16	0.001	0.115	0.001	0.173	Pass
17	0.073	0.132	0.084	0.198	Pass
18	0.001	0.102	0.001	0.153	Pass
19	0.049	0.118	0.057	0.178	Pass
20	0.001	0.092	0.001	0.138	Pass
21	0.038	0.107	0.042	0.161	Pass
22	0.001	0.084	0.001	0.125	Pass
23	0.037	0.098	0.038	0.147	Pass
24	0.001	0.077	0.001	0.115	Pass
25	0.038	0.090	0.039	0.135	Pass
26	0.001	0.071	0.001	0.107	Pass
27	0.035	0.083	0.037	0.125	Pass
28	0.002	0.066	0.002	0.099	Pass
29	0.030	0.078	0.033	0.116	Pass
30	0.001	0.061	0.001	0.092	Pass
31	0.022	0.073	0.026	0.109	Pass
32	0.002	0.058	0.002	0.086	Pass
33	0.015	0.068	0.018	0.102	Pass
34	0.001	0.054	0.001	0.081	Pass
35	0.010	0.064	0.012	0.096	Pass
36	0.001	0.051	0.001	0.077	Pass
37	0.010	0.061	0.013	0.091	Pass
38	0.001	0.048	0.001	0.073	Pass
39	0.011	0.058	0.013	0.087	Pass
40	0.001	0.046	0.001	0.069	Pass

5.1.2 Voltage changes, voltage fluctuations and flicker on AC mains

Result:	**Passed**

Date of testing : 2024-11-19
Test procedure : EN 61000-3-3:2013+A1+A2
Ambient condition : Temperature: 23.5 ºC; Relative humidity: 48.2 %
Test condition : Robot worked on charging mode by charging station

According to the characteristics of the sample, as specified by clause 5 of the basic standard, following limits apply:

- T_{max}, the accumulated time value of d(t) with a deviation exceeding 3.3 % during a single voltage change at the EUT terminals, shall not exceed 500 ms;
- the maximum relative steady-state voltage change d_c, shall not exceed 3.3 %;
- the maximum relative voltage change d_{max}, shall not exceed 6 %.

Following are the measurement results obtained via an automatic testing system.

Table 2: Voltage fluctuations and flicker measurement results

	d_c	d_{max}	T_{max}	P_{st}	P_{lt}
Limits	3.3 %	6 %	500 ms	1.000	N/A
Result	0 %	0 %	0 ms	0.136	N/A

5.1.3 Mains Terminal Continuous Disturbance Voltage

Result:	**Passed**

Date of testing	:	2024-11-20
Test procedure	:	EN 55032:2015
Reference clause	:	EN 301 489-1 V2.2.3:2019, clause 8.4
Frequency range	:	0.15 – 30 MHz
Limit	:	Table A.10 of EN 55032:2015
Kind of test site	:	Shielded room
Ambient condition	:	Temperature: 22.5 °C; Relative humidity: 48.6 %
Expanded measurement uncertainty (k=2)	:	2.33 dB

Test Setup

Input voltage	:	AC 230 V, 50 Hz
Operational mode	:	Mode 1: Wireless charging dock standby mode Mode 2: Wireless charging dock charging mode
Artificial hand	:	N/A
Earthing	:	Earthed through power cord (as class I equipment)

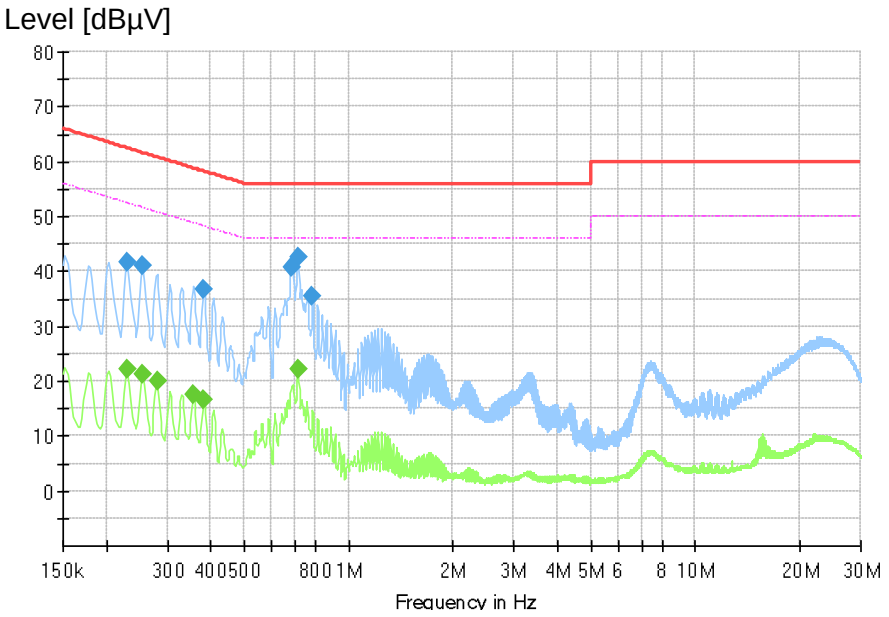
The measurement equipment like test receivers, quasi-peak detector and Artificial Mains Network (AMN) are in compliance with CISPR 16-1 series standards. The tested object was operated under its rated voltage and its rated frequency.

Furthermore an internal calibration with the test receiver was conducted prior to each measurement.

The tested object was placed on a wooden support above reference ground plane. The EUT was set 0.8 m away from the AMN. The cord longer than necessary to be connected to the AMN was folded forth and back parallel so as to form a bundle with a length between 0.3 m and 0.4 m.

The following figures and tables were those measured by an automatic measuring system. Both Quasi-Peak and Average Value were measured. Quasi-Peak and Average Value were measured and listed respectively where they had a maximum in previous scanning survey. In the following figures, "♦" means measurement results with quasi-peak detector and "♦" means measurement results with average detector.

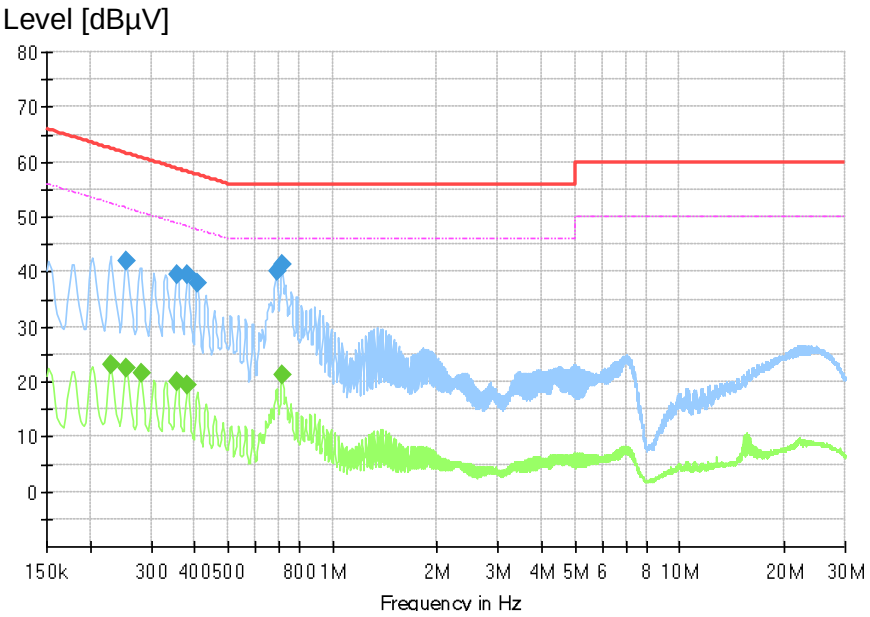
Figure 1: Spectral Diagrams, Conducted Emission, 150 kHz – 30 MHz, line L for mode 1



Final measurement results:

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.228750	---	22.12	52.50	30.38	1000.0	9.000	L1	10.3
0.228750	41.75	---	62.50	20.75	1000.0	9.000	L1	10.3
0.253500	40.95	---	61.64	20.69	1000.0	9.000	L1	10.3
0.255750	---	21.16	51.57	30.41	1000.0	9.000	L1	10.3
0.280500	---	19.86	50.80	30.94	1000.0	9.000	L1	10.3
0.357000	---	17.41	48.80	31.39	1000.0	9.000	L1	10.3
0.381750	36.79	---	58.24	21.45	1000.0	9.000	L1	10.3
0.381750	---	16.72	48.24	31.52	1000.0	9.000	L1	10.3
0.687750	40.61	---	56.00	15.39	1000.0	9.000	L1	10.3
0.714750	42.54	---	56.00	13.46	1000.0	9.000	L1	10.3
0.714750	---	22.02	46.00	23.98	1000.0	9.000	L1	10.3
0.786750	35.59	---	56.00	20.41	1000.0	9.000	L1	10.4

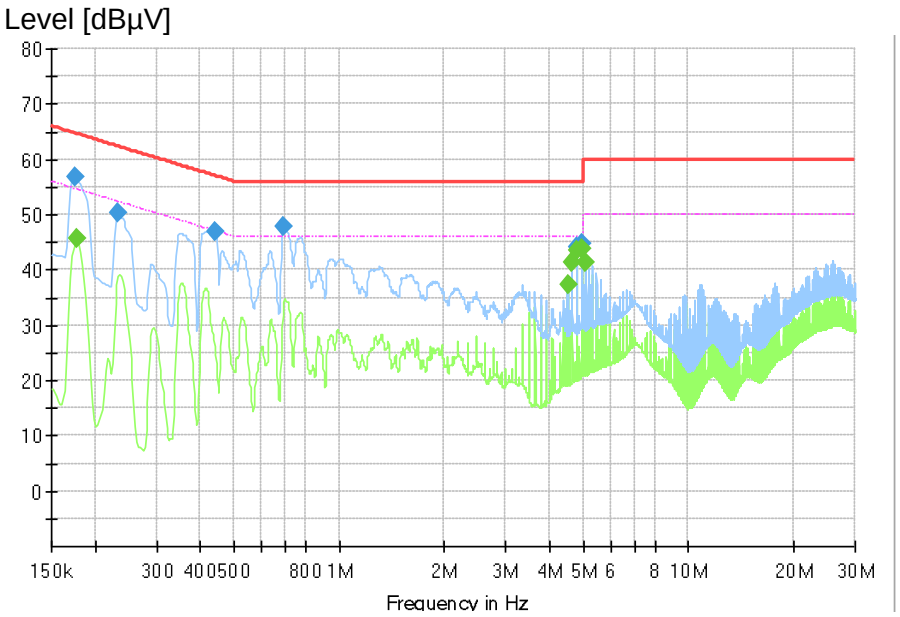
Figure 2: Spectral Diagrams, Conducted Emission, 150 kHz – 30 MHz, line N for mode 1



Final measurement results:

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.228750	---	23.04	52.50	29.45	1000.0	9.000	N	10.7
0.253500	42.04	---	61.64	19.60	1000.0	9.000	N	10.6
0.255750	---	22.34	51.57	29.23	1000.0	9.000	N	10.6
0.280500	---	21.58	50.80	29.22	1000.0	9.000	N	10.6
0.357000	---	19.87	48.80	28.93	1000.0	9.000	N	10.4
0.357000	39.53	---	58.80	19.27	1000.0	9.000	N	10.4
0.381750	39.39	---	58.24	18.85	1000.0	9.000	N	10.4
0.381750	---	19.42	48.24	28.82	1000.0	9.000	N	10.4
0.406500	38.03	---	57.72	19.69	1000.0	9.000	N	10.3
0.690000	39.99	---	56.00	16.01	1000.0	9.000	N	10.4
0.714750	---	21.12	46.00	24.88	1000.0	9.000	N	10.4
0.717000	41.33	---	56.00	14.67	1000.0	9.000	N	10.4

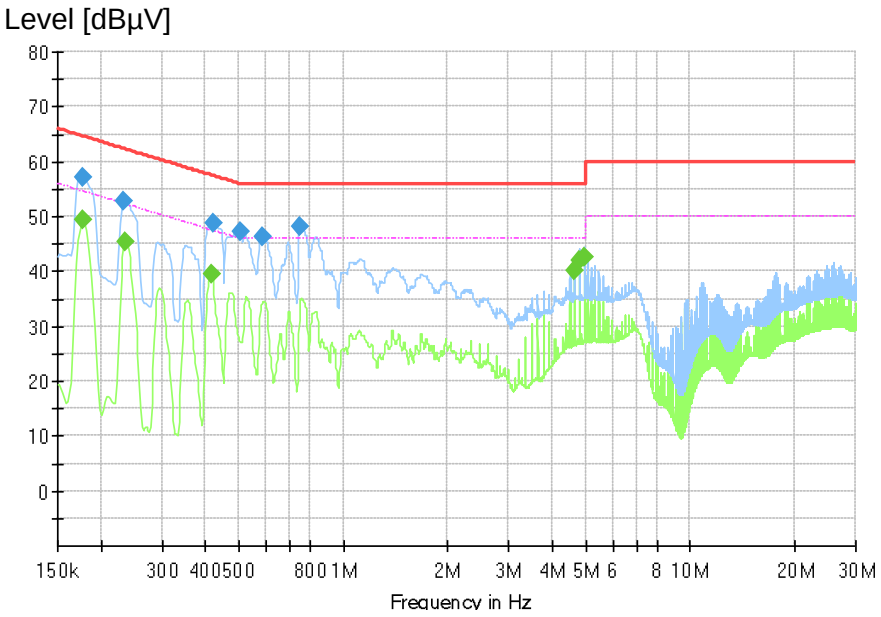
Figure 3: Spectral Diagrams, Conducted Emission, 150 kHz – 30 MHz, line L for mode 2



Final measurement results:

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.174750	56.91	---	64.73	7.83	1000.0	9.000	L1	10.3
0.177000	---	45.63	54.63	8.99	1000.0	9.000	L1	10.3
0.233250	50.33	---	62.33	12.01	1000.0	9.000	L1	10.3
0.442500	46.89	---	57.02	10.12	1000.0	9.000	L1	10.3
0.694500	47.81	---	56.00	8.19	1000.0	9.000	L1	10.3
4.508250	---	37.44	46.00	8.56	1000.0	9.000	L1	10.3
4.654500	---	41.44	46.00	4.56	1000.0	9.000	L1	10.3
4.800750	---	43.46	46.00	2.54	1000.0	9.000	L1	10.3
4.800750	44.18	---	56.00	11.82	1000.0	9.000	L1	10.3
4.944750	---	43.88	46.00	2.12	1000.0	9.000	L1	10.3
4.944750	44.64	---	56.00	11.36	1000.0	9.000	L1	10.3
5.091000	---	41.42	50.00	8.58	1000.0	9.000	L1	10.3

Figure 4: Spectral Diagrams, Conducted Emission, 150 kHz – 30 MHz, line N for mode 2



Final measurement results:

Frequency (MHz)	QuasiPeak (dBuV)	CAverage (dBuV)	Limit (dBuV)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Line	Corr. (dB)
0.177000	---	49.41	54.63	5.22	1000.0	9.000	N	10.5
0.177000	57.24	---	64.63	7.39	1000.0	9.000	N	10.5
0.233250	52.71	---	62.33	9.62	1000.0	9.000	N	10.7
0.235500	---	45.45	52.25	6.80	1000.0	9.000	N	10.7
0.415500	---	39.35	47.54	8.19	1000.0	9.000	N	10.3
0.422250	48.80	---	57.40	8.60	1000.0	9.000	N	10.3
0.505500	47.24	---	56.00	8.76	1000.0	9.000	N	10.2
0.586500	46.31	---	56.00	9.69	1000.0	9.000	N	10.3
0.753000	48.26	---	56.00	7.74	1000.0	9.000	N	10.4
4.654500	---	39.98	46.00	6.03	1000.0	9.000	N	10.7
4.800750	---	42.05	46.00	3.95	1000.0	9.000	N	10.7
4.944750	---	42.45	46.00	3.55	1000.0	9.000	N	10.7

5.2 Emission in the Frequency Range above 30 MHz

5.2.1 Radiated emission

Result:	**N/A**

Radiated emission requirements of EN 301 489-1 V2.2.3:2019, EN 301 489-3 V2.3.2:2023 and EN 301 489-17 V3.2.4:2020 are only applicable for ancillary equipment. The EUT does not belong to ancillary equipment; therefore, radiated emission requirements do not apply as well.

6 Test Results I M M U N I T Y

During the immunity tests, the EUT was operated under conditions specified by clause 3.1 of this report.

According to EN 301 489-1 V2.2.3:2019 clause 6, following performance criteria apply for the EUT.

6.1 Performance criteria for continuous phenomena

During the test, the equipment shall:

- continue to operate as intended;
- not unintentionally transmit;
- not unintentionally change its operating state;
- not unintentionally change critical stored data.

6.2 Performance criteria for transient phenomena

For all ports and transient phenomena with the exception described below, the following applies:

- The application of the transient phenomena shall not result in a change of the mode of operation (e.g. unintended transmission) or the loss of critical stored data.
- After application of the transient phenomena, the equipment shall operate as intended.

For surges applied to symmetrically operated wired network ports intended to be connected directly to outdoor lines the following criteria applies:

- For products with only one symmetrical port intended for connection to outdoor lines, loss of function is allowed, provided the function is self-recoverable, or can be otherwise restored. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.
- For products with more than one symmetrical port intended for connection to outdoor lines, loss of function on the port under test is allowed, provided the function is self-recoverable. Information stored in non-volatile memory, or protected by a battery backup, shall not be lost.

According to EN 301 489-3 V2.3.2:2023 clause 6, following performance criteria apply for the EUT.

6.1 Introduction

The performance criteria are used to make an assessment whether a radio equipment passes or fails immunity tests.

Only the performance criteria specified in the present document or in ETSI EN 301 489-1 [1] where referenced shall apply.

The provisions of ETSI EN 301 489-1 [1] clause 6 shall apply, together with clauses 6.2 and 6.3 of the present document.

6.2 Continuous and non-continuous operation

Latency is the time delay between the initiation and the completion of operation of the EUT. Correct functioning requires completing the relevant operation within the maximum latency time.

Where the maximum latency is specified in the applicable harmonised radio standard (in the wanted performance criterion, or an acknowledge requirement), that value shall be used. Where this is not the case, then the maximum latency is that required by the intended use of the EUT.

According to EN 301 489-17 V3.2.4:2020 clause 6, following performance criteria apply for the EUT.

6.1 General performance criteria

The performance criteria are:
• performance criteria A for immunity tests with phenomena of a continuous nature;
• performance criteria B for immunity tests with phenomena of a transient nature;
• performance criteria C for immunity tests with power interruptions exceeding a certain time.

The equipment shall meet the minimum performance criteria as specified in the following clauses.

6.2 Performance table

6.2.1 Performance criteria overview

Criteria	During test	After test (i.e. as a result of the application of the test)
A	Shall operate as intended. (See note). Shall be no loss of function. Shall be no unintentional transmissions.	Shall operate as intended. Shall be no degradation of performance. Shall be no loss of function. Shall be no loss of critical stored data.
B	May be loss of function.	Functions shall be self-recoverable. Shall operate as intended after recovering. Shall be no loss of critical stored data.
C	May be loss of function.	Functions shall be recoverable by the operator. Shall operate as intended after recovering. Shall be no loss of critical stored data.
NOTE: Operate as intended during the test allows a level of degradation in accordance with clause 6.2.2.		

6.2.2 Minimum performance level

For equipment that supports a PER or FER, the minimum performance level shall be a PER or FER less than or equal to 10 %.

For equipment that does not support a PER or a FER, the minimum performance level shall be no loss of the wireless transmission function needed for the intended use of the equipment.

6.3 Performance criteria for Continuous phenomena

The performance criteria A shall apply.

Where the EUT is a transmitter in standby mode, unintentional transmission shall not occur during the test.

Where the EUT is a transceiver in receive mode, unintentional transmission shall not occur during the test.

6.4 Performance criteria for Transient phenomena

The performance criteria B shall apply, except for voltage dips greater than or equal to 100 ms and voltage interruptions of 5 000 ms duration, for which performance criteria C shall apply.

Where the EUT is a transmitter in standby mode, unintentional transmission shall not occur as a result of the application of the test.

Where the EUT is a transceiver in receive mode, unintentional transmission shall not occur as a result of the application of the test.

Date of testing: **2024-11-19 ~ 2024-11-22**

Room temperature: **20.5 – 24.7 °C**
Relative humidity: **48.0 – 53.2 %**

According to the electrical characteristics and EN 301 489-1 V2.2.3:2019, the cordless robotic pool cleaner and wireless charging dock belong to III equipment. The battery charger belongs to I equipment.

The following tests were performed while the battery charger was continuously charging a cordless robotic pool cleaner at AC 230 V, 50 Hz and the cordless robotic pool cleaner was continuously working at DC 25.2 V by battery.

6.1 Enclosure

6.1.1 Electrostatic Discharge

Result:	**Passed**

During the test, the EUT was placed on 0.1 m high wooden table above the ground plane. The minimum distance between the EUT and all other conductive structures except the ground plane beneath the EUT is more than 0.5 m. The size of the reference ground plane is more than 2 m by 2 m.

A vertical coupling plane (VCP) of dimensions 0.5 m x 0.5 m is placed parallel to and positioned at a distance of 0.1 m from the EUT.

Basic standard	:	IEC 61000-4-2
Reference clause	:	EN 301 489-1 V2.2.3:2019, clause 9.3 EN 301 489-3 V2.3.2:2023, clause 7.3 EN 301 489-17 V3.2.4:2020, clause 7.2
Charge voltage	:	±4.0 kV (Contact discharge), ±8.0 kV (Air discharge)
Polarity	:	positive / negative
Number of discharges	:	20 discharges (10 with positive and 10 with negative polarity) to each selected point
Type of equipment	:	Floor-standing
Ambient condition	:	Temperature: 23.5 °C; Relative humidity: 48.0 %
Atmospheric pressure	:	100.7 kPa
Operational mode	:	Mode 1: Wireless charging dock standby mode Mode 2: Wireless charging dock charging mode Mode 3: Cordless robotic pool cleaner cleaning mode
Performance criteria	:	B

Table 3: ESD test results, positive / negative polarity

Tested positions	Kind of Discharge	Actual performance	Result
Buttons	Air discharge ±8 kV	During the test, the EUT worked as intended and no degradation of performance	Pass
Non-metal enclosure	Air discharge ±8 kV		Pass
Seam	Air discharge ±8 kV		Pass
Plastic interface	Air discharge ±8 kV		Pass
LED light	Air discharge ±8 kV		Pass
Power cable	Air discharge ±8 kV		Pass
Coupling plane (VCP)	Contact discharge ±4 kV		Pass

6.1.2 Radio Frequency Electromagnetic Field

Result:	**Passed**

The test was performed inside a fully-anechoic chamber for the whole frequency range with the part of the ground plane between the field generating antenna and the equipment under test covered by absorbing material. The distance between the tip of the antenna and the side of system tested is 3 m in the frequency band 80-1000 MHz and 3.6 m above 1000 MHz. The field uniformity of the test sites is regularly calibrated to ensure the 0-6 dB field uniformity criterion as specified by IEC 61000-4-3 is met.

Basic standard	:	IEC 61000-4-3
Reference clause	:	EN 301 489-1 V2.2.3:2019, clause 9.2 EN 301 489-3 V2.3.2:2023, clause 7.3 EN 301 489-17 V3.2.4:2020, clause 7.2
Test level	:	3 V/m
Frequency range	:	80-6000 MHz
Modulation	:	80 % AM, 1 kHz
Frequency sweep speed	:	Frequency step: 1 %; Dwell time: 3 s
Type of equipment	:	Floor-standing
Operational mode	:	Mode 1: Wireless charging dock standby mode Mode 2: Wireless charging dock charging mode Mode 3: Cordless robotic pool cleaner cleaning mode
Performance criteria	:	A
Actual Performance	:	A

Table 4: Radiated Susceptibility, Field Strength

Field polarization	Position	Observation	Remarks
Horizontal polarization	Front side	No degradation of performance or loss of function The PER is 1.3 % and less than 10 %	Pass
	Rear side		
	Left side		
	Right side		
Vertical polarization	Front side		Pass
	Rear side		
	Left side		
	Right side		

6.2 Power Ports

6.2.1 Fast Transients

Result:	**Passed**

During the test, the EUT was placed on a 0.1 m high wooden support above the reference ground plane. The minimum distance between the EUT and all other conductive structures except the reference ground plane beneath the EUT is more than 1 m.

The length between the coupling device and the EUT is 1 m ± 0.05 m. The cord length more than 1 m, the excess length of this cable shall be folded to avoid a flat coil and situated at a distance of 0.1 m above the ground reference plane.

Basic standard	:	IEC 61000-4-4
Reference clause	:	EN 301 489-1 V2.2.3:2019, clause 9.5 EN 301 489-3 V2.3.2:2023, clause 7.3 EN 301 489-17 V3.2.4:2020, clause 7.2
Test voltage	:	1 kV (for AC power ports)
Polarity	:	negative / positive
Repetition frequency	:	5 kHz
Test duration	:	≥120 sec.
t_r/t_w	:	5 ns / 50 ns
Type of equipment	:	Floor-standing
Operational mode	:	Mode 1: Wireless charging dock standby mode Mode 2: Wireless charging dock charging mode
Performance criteria	:	B

Table 5: Fast transients test results, positive / negative polarity

Tested ports or lines	Coupling method	Actual performance	Result
AC Input port	CDN	During the test, the EUT worked as intended and no degradation of performance	Pass

6.2.2 Injected Current

Result:	**Passed**

During the test, the sample was placed on a 0.1 m high wooden support above the reference ground plane. The minimum distance between the sample and all other conductive structures except the reference ground plane beneath the EUT is more than 0.5 m.

A CDN was used to couple the disturbing signal onto the power input port of the sample. The distance between the EUT and the injected point is within 0.1-0.3 m. The cable between the EUT and current injection point is placed about 50 mm above the reference ground plane. For signal ports, a current injection probe was used to coupling the disturbance signal.

Basic standard	:	IEC 61000-4-6
Reference clause	:	EN 301 489-1 V2.2.3:2019, clause 9.3 EN 301 489-3 V2.3.2:2023, clause 7.3 EN 301 489-17 V3.2.4:2020, clause 7.2
Voltage level	:	3 V(r.m.s, unmodulated)
Environmental phenomena	:	RF current common mode, 1 kHz, 80 % AM
Source impedance	:	150 Ω
Frequency range	:	0.15 – 230 MHz
Frequency step	:	1 %
Dwell time	:	3 s
Type of equipment	:	Floor-standing
Operational mode	:	Mode 1: Wireless charging dock standby mode Mode 2: Wireless charging dock charging mode
Performance criteria	:	A

Table 6: Injected current test results

Tested ports or lines	Coupling method	Actual performance	Result
AC Input port	CDN	During the test, the EUT worked as intended and no degradation of performance	Pass

6.2.3 Surges to AC Power Port

Result:	**Passed**

The immunity against surges to AC power port was tested in accordance to EN IEC 55014-2:2021. Test setup and the Combination Wave Generator (CWG) are according to IEC 61000-4-5 which is specified by EN 301 489-1 V2.2.3:2019.

The EUT is placed on 0.1 m wood support above the ground plane.

Basic standard	:	IEC 61000-4-5
Reference clause	:	EN 301 489-1 V2.2.3:2019, clause 9.8 EN 301 489-3 V2.3.2:2023, clause 7.3 EN 301 489-17 V3.2.4:2020, clause 7.2
Open-circuit test voltage	:	1 kV (line to line) 2 kV (line to earth)
T_f/T_d	:	1.2/50 μs (open-circuit voltage) 8/20 μs (short-circuit current)
Test numbers	:	5 positive and 5 negative pulses
Phase angle	:	90° for positive pulses 270° for negative pulsess
Repetition rate	:	1 surge/min
Type of equipment	:	Floor-standing
Operational mode	:	Mode 1: Wireless charging dock standby mode Mode 2: Wireless charging dock charging mode
Performance criteria	:	B

Table 7: Surges to AC input power port, positive / negative polarity

Tested ports or lines	Actual performance	Result
Phase to neutral	During the test, the EUT worked as intended and no degradation of performance	Pass
Phase to earth		
Neutral to earth		

6.2.4 Voltage dips to AC Power Port

Result:	**Passed**

The immunity against voltage dips to AC power port was tested in accordance to EN IEC 55014-2:2021. Test setup and the test generator are according to IEC 61000-4-11 which is specified by EN IEC 55014-2:2021.

Basic standard	:	IEC 61000-4-11		
Reference clause	:	EN 301 489-1 V2.2.3:2019, clause 9.7		
		EN 301 489-3 V2.3.2:2023, clause 7.3		
		EN 301 489-17 V3.2.4:2020, clause 7.2		
Performance criteria	:	Voltage dip:	0% residual voltage for 0.5 T	B
			0% residual voltage for 1 T	B
			70% residual voltage for 25 T	B
		Voltage interruptions	0% residual voltage for 250 T	C
Operational mode	:	Mode 1: Wireless charging dock standby mode		
		Mode 2: Wireless charging dock charging mode		

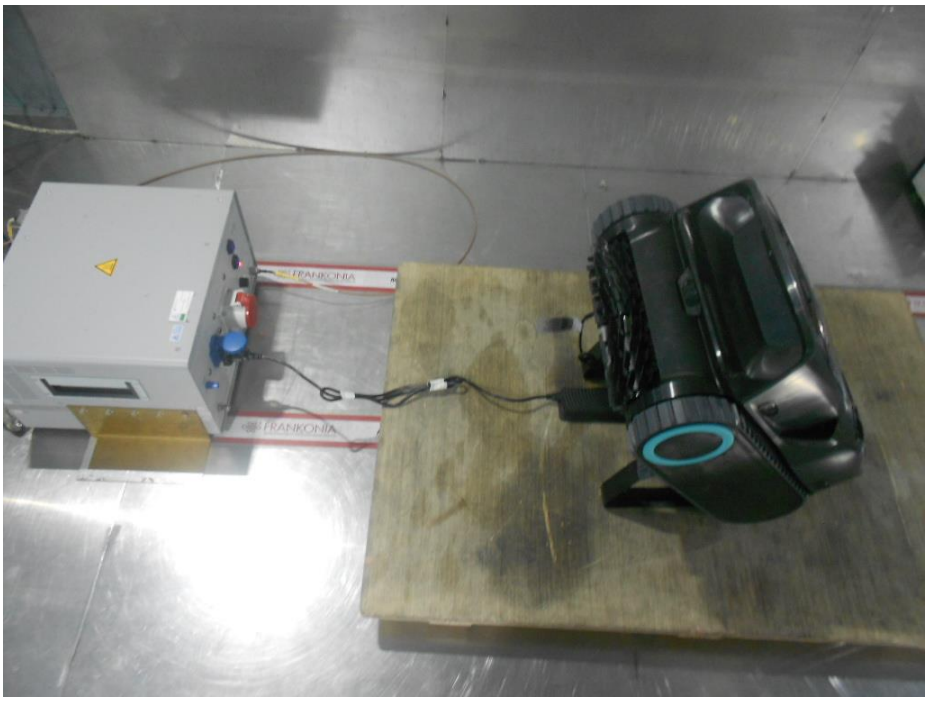
Table 8: Test level and test results for voltage dips

Test level (in % U_T)	Duration	Actual performance	Result
0	0.5 cycle (10 ms)	During the test, the EUT worked as intended and no degradation of performance	Pass
40	10 cycles (200 ms)		Pass
70	25 cycles (500 ms)		Pass
0	250 cycles (5 s)	During the test, the EUT stop charging. After the disturbance ceased, it could be restored automatically	Pass

7 Photographs of the Test Set-Up

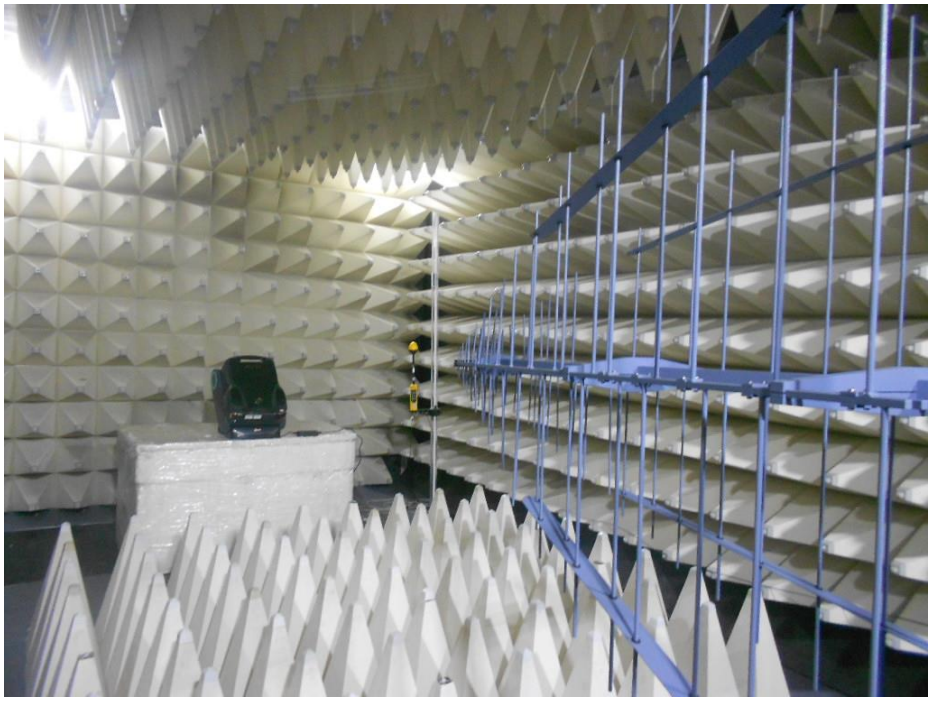
Photograph 1: Set-up for measurement of harmonics and voltage fluctuation

Photograph 2: Set-up for measurement of disturbance voltage

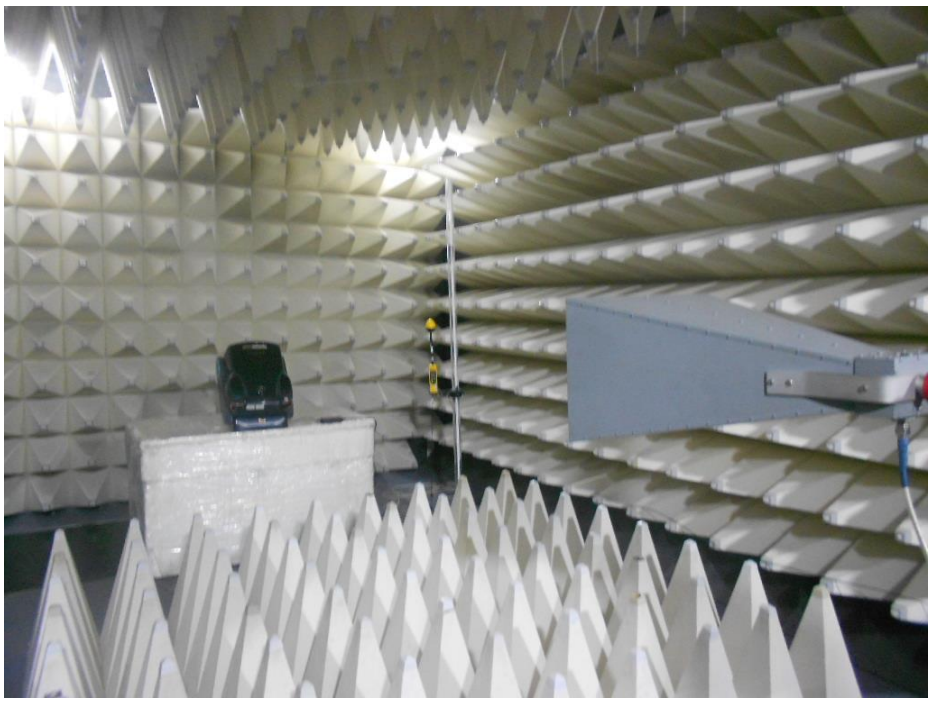


Photograph 3: Set-up for immunity test of ESD

Photograph 4: Set-up for immunity test of Radio Frequency Electromagnetic Field

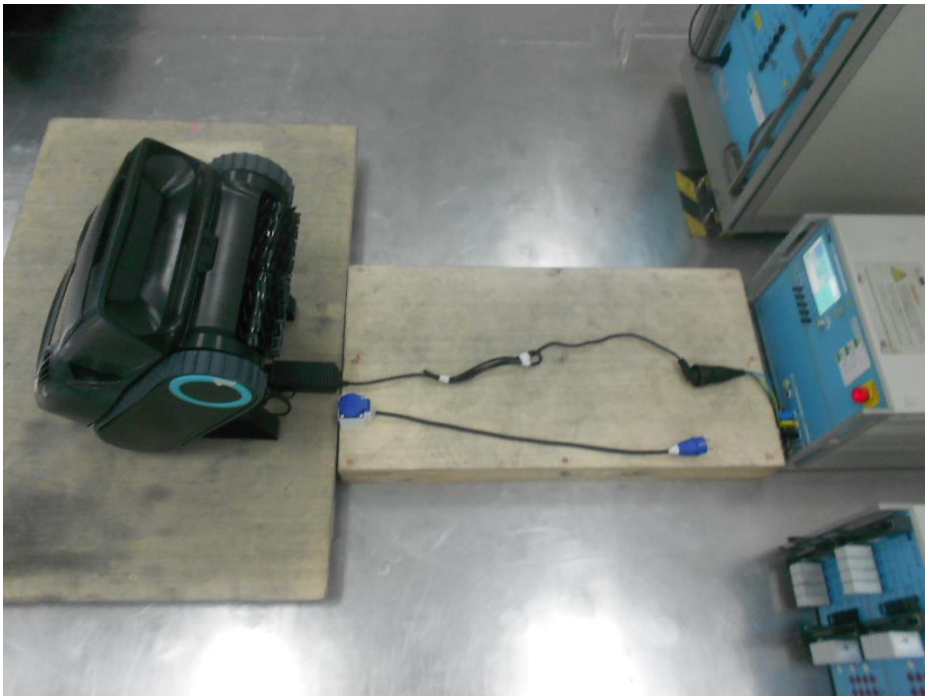


(Below 1 GHz)

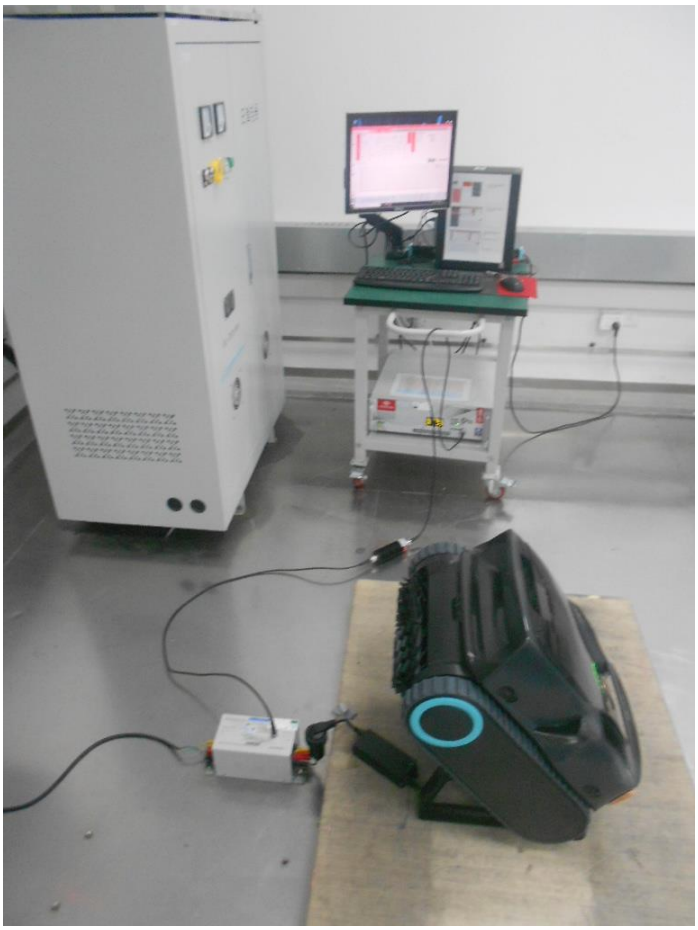


(Above 1 GHz)

Photograph 5: Set-up for immunity test of EFT and surge



Photograph 6: Set-up for immunity test of injected current



Photograph 7: Set-up for immunity test of voltage dips

8 List of Test and Measurement Instruments

Equip.	Description	Model	Manufacturer	Last Date DD.MM.YYYY	Due Date DD.MM.YYYY
9041610	Harmonics/voltage fluctuation tester	5001ix-CTS-400	California Instruments	04.02.2024	04.02.2025
9041611	5kVA AC power source	5001ix-400	California Instruments	10.07.2024	10.07.2025
9049454	Harmonics/flicker measurement software	CTS 4 (4.29.0)	California Instruments	N/A	N/A
9061503	Shielded enclosure	10.055x3.605x3.000	Frankonia	08.11.2023	08.11.2028
9023229	EMI test receiver	ESR3	Rohde&Schwarz	03.08.2024	03.08.2025
G1824248	Dual display multimeter	F45	Fluke	28.06.2024	28.06.2025
9062744	EMI measurement software	EMC32-E+(10.60.20)	Rohde&Schwarz	N/A	N/A
G1830003	Artificial mains network	ENV432	Rohde&Schwarz	11.10.2024	11.10.2025
9047660	ESD generator	NSG 437	Teseq	21.03.2024	21.03.2025
9053496	Thermohygrometer and barometer	622	testo	26.07.2024	26.07.2025
G1811416	Fully anechoic chamber	FAC3plus	Frankonia	03.12.2023	03.12.2026
9022048	Signal generator	SMB100A	Rohde&Schwarz	15.12.2023	15.12.2024
9049427	Power amplifier	NTWPA-00810500	Nanjing Rflight Communication	17.10.2024	17.10.2025
G1825214	Power amplifier	AS0825-170	Milmega	03.08.2024	03.08.2025
G1811397	Power amplifier	AS0206-50	Milmega	14.12.2023	14.12.2024
G1817022	Average power sensor	NRP6AN	Rohde&Schwarz	03.08.2024	03.08.2025
G1817023	Average power sensor	NRP6AN	Rohde&Schwarz	03.08.2024	03.08.2025
G1811398	Broadband field meter	NBM-520	Narda	09.07.2024	09.07.2025
G1811399	E-field Probe	EF1891	Narda	09.07.2024	09.07.2025
G1811432	EMS antenna	HL 046	Rohde&Schwarz	N/A	N/A
G1811433	Broadband horn antenna	BBHA 9120 E	Schwarzbeck	N/A	N/A
G1828661	40dB dual-directional coupler	C5982	Werlatone	05.02.2024	05.02.2025
G1828662	40dB dual-directional coupler	C6187	Werlatone	05.02.2024	05.02.2025
9062746	EMS measurement software	EMC32-S (10.60.20)	Rohde&Schwarz	N/A	N/A
9053478	Multi-function generator	IMU-MGE	EMC Partner	17.10.2024	17.10.2025
9059609	Conducted immunity test system	CIT-100-75	Frankonia Test-Systems	29.10.2024	29.10.2025
G1814624	Coupling/decoupling network	CDN M016	Schaffner	03.07.2024	03.07.2025
9053515	Voltage dip test system	HPFS 1003P, HV3P100T	Shenzhen HTEC	23.10.2024	23.10.2025

9 List of Tables

10 List of Figures

11 List of Photographs

End of test report