Prüfbericht-Nr.: *Test report no.*:	**50203428 002**	**Auftrags-Nr.:** *Order no.*:	180262900	Seite 1 von 32 *Page 1 of 32*
Kunden-Referenz-Nr.: *Client reference no.*:	N/A	**Auftragsdatum:** *Order date:*	2023.05.15	
Auftraggeber: *Client*:	Zhejiang Bellagio Luxury Co., Ltd. Tianzihu Industrial Park Gaoyu Town, Anji 313310 Zhejiang P.R. China			
Prüfgegenstand: *Test item*:	Massage Bathtub			
Bezeichnung / Typ-Nr.: *Identification / Type no.*:	Refer to page 3			
Auftrags-Inhalt: *Order content*:	TÜV Rheinland – EMC Service			
Prüfgrundlage: *Test specification*:	**EN IEC 55014-1:2021** **EN IEC 55014-2:2021** **EN 61000-3-3:2013+A1+A2** **EN IEC 61000-3-2:2019+A1**			

Wareneingangsdatum: *Date of sample receipt*:	2023.08.09
Prüfmuster-Nr.: *Test sample no:*	A003520676-001
Prüfzeitraum: *Testing period*:	2023.08.14-2023.08.18
Ort der Prüfung: *Place of testing*:	Refer to section 1.1
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland / CCIC (Ningbo) Co., Ltd.
Prüfergebnis*: *Test result**:	Pass

geprüft von: tested by:	Bingbing Li	**genehmigt von:** *authorized by*:	Shey Zheng
Datum: *Date:* 2023.09.25		**Ausstelldatum:** *Issue date:* 2023.09.25	
Stellung / Position:	Bingbing Li/PE	**Stellung** / Position:	Shey Zheng/Authorizer

Sonstiges / *Other*: Refer to page 3 for further information.

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

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

Prüfbericht - Nr.: 50203428 002
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.*

- Model List:

No.	Series Model	Rated Input
1	PT1401, PT1402, PT1501, PT1502, PT1601, NR1401, NR1402, NR1403, NR1406, NR1420, NR1500, NR1501, NR1502, NR1503, NR1506, NR1508, NR1509, NR1510, NR1512, NR1601, NR1602, NR1701, RT1701, RT1801, RT1901, RT1902, IR1902, RT1502, RT1605, RT1703, RT1503, RT1603, RT1708, RT1601, RT1705, RT1706, RT1712, RT1802, RT1803, RT1804, RT1821, RT1806, RT1809, RT1812, RT1810, RT1813, IR1802, IR1803, RENO, PIAVE, BURANO-1.5, BURANO-1.6, BURANO-1.7, BURANO-1.785, Foglia, Bolsena, Garda-1.5, Garda-1.7, Iseo	AC 230V, 50Hz, 750W
2	DR1801, DR1501, DR1502, NR1505, NR1407, NR1408, RT1610, RT1510, RT2001, NR1405, RT1822, RT1808, VASTERA, HURON, VARESE, VICHY, HEVIS, LINDO, LUGANO, MAGGIORE, BODEN, BOTTEGA	AC 230V, 50Hz, 10A

Other aspects:

1. This case is to update standards and add new models.
2. Series model No.1 have been EMC approved in test report 50203428 001.
3. In this report, the standards EN 55014-1:2017, EN 55014-2:2015, EN 61000-3-2:2014 and EN 61000-3-3:2013 have been updated to EN IEC 55014-1:2021, EN IEC 55014-2:2021, EN IEC 61000-3-2:2019+A1 and EN 61000-3-3:2013+A1+A2 respectively. The samples have been received and checked. According to the contents of update, no additional test is needed.
4. In electrical characteristics, all new models are the same except model names.
5. Therefore all EMC tests were performed as below table. The symbol "√" means the testing item was performed.

Model	DV	DP	Har	Flicker	Click	ESD	EFT	RS	Surge	CS	Dips
TR1510	√	√	√	√	√	√	√		√	√	√

6. This test report is valid with the test report 50203428 001.

TEST SUMMARY

5.1.1 HARMONICS ON AC MAINS
Result:
Pass
5.1.2 VOLTAGE CHANGES, VOLTAGE FLUCTUATIONS AND FLICKER ON AC MAINS
Result:
Pass
5.1.3 MAINS TERMINAL CONTINUOUS DISTURBANCE VOLTAGE
Result:
Pass
5.1.4 DISCONTINUOUS INTERFERENCE ON AC MAINS
Result:
Pass
5.2.1 DISTURBANCE POWER
Result:
Pass
5.2.2 RADIATED DISTURBANCE IN THE FREQUENCY RANGE FROM 30MHZ TO 1000MHZ
Result:
Pass
6.1.1 ELECTROSTATIC DISCHARGE
Result:
Pass
6.2.1 FAST TRANSIENTS ON AC POWER LINES
Result:
Pass
6.2.2 INJECTED CURRENT INTO AC POWER PORT
Result:
Pass
6.2.3 SURGES TO AC POWER PORT
Result:
Pass
6.2.4 VOLTAGE DIPS AND INTERRUPTIONS TO AC POWER PORT
Result:
Pass

Contents

1 Test Sites

1.1 Test Facilities

Laboratory: EMTEK (NINGBO) CO., LTD.

No. 8, Building 8, Lane 216, Qingyi Road, Hi-Tech Zone, Ningbo, Zhejiang, China

The tests performed in Laboratory were under supervision of TÜV Rheinland/CCIC's engineer.
The used test equipment is in accordance with CISPR 16-1 series standards for measurement of radio interference.

1.2 List of Test and Measurement Instruments

Table 1: List of Test and Measurement Equipment of Laboratory

No.	Equipment	Model	Serial no.	Cal. due date
1.	EMI Test Receiver	ESCI	101108	2023.12.28
2.	L.I.S.N	NSLK 8126	8126-462	2024.07.05
3.	Absorbing Clamp	MDS21	100397	2024.07.05
4.	Click Meter	DDA55+	14042134205	2023.11.22
5.	ICE VOLTAGE DIPS Module/ICE	EPTS-75A-3	20027	2023.11.17
6.	Harmonic/ flicker analyzer	ECTS2-3300Z-M18012	550128	2023.11.17
7.	AC Power source	330AZX-CE	140250014	2023.11.17
8.	ESD Tester	NSG 437	1732	2023.11.29
9.	Coupling and Decoupling Network Three Phase	FP-EFT 32M	190170	2023.12.28
10.	Combination Wave Generator	HCWG 100	204303	2023.11.17
11.	Three Phase Coupling/Decoupling Network	HCOUPLER 30S	204103	2023.11.17
12.	Simulator	CDG-6000-75	126B1404/2016	2024.07.05
13.	CDN	CDN-M2+3	A2210415/2016	2023.11.17

1.3 Measurement Uncertainty

Test Item	Expanded Measurement Uncertainty (k=2)
Conducted Emission (9-150kHz)	2.08dB
Conducted Emission (150k-30MHz)	2.40dB
Disturbance Power	4.34dB
Click	1.50dB
Harmonic test	4.16%
Flicker test	0.43%

2 General Product Information

2.1 Product Function and Intended Use

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

2.2 Ratings and System Details

System input voltage	:	Refer to page 3	For all models
Frequency	:	Refer to page 3	For all models
Rated Input	:	Refer to page 3	For all models
Protection class	:	I	For all models
Highest clock frequency F_x	:	< 15 MHz	For all models

Refer to the user's manual for further information.

2.3 Independent Operation Modes

The basic operation modes are: "On" or "Off".
Refer to the user's manual for further information.

2.4 Noise Generating and Noise Suppressing Parts

Refer to the Circuit diagram for further information.

2.5 Submitted Documents

Internal photos, label and user's manual etc.

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 radiation 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

Refer to the related paragraph of this report. No software was used.

3.4 Special Accessories and Auxiliary Equipment

None.

3.5 Countermeasures to achieve EMC Compliance

The tested sample contained noise suppression components as described in the circuit diagram. No 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 E M I S S I O N

5.1 Emission in the Frequency Range up to 30 MHz

5.1.1 Harmonics on AC Mains

Result:	**Pass**

Date of testing	:	2023.08.18
Test procedure	:	EN IEC 61000-3-2:2019+A1
Test duration	:	2.5min
Harmonic order	:	2 – 40th
Frequency range	:	0 – 2kHz
Test voltage	:	AC 230V, 50Hz
Ambient Condition	:	Temperature: 23 ^{o}C; Relative Humidity: 68 %
Test conditions	:	EN IEC 61000-3-2:2019+A1 clause B.5

The harmonics on AC Mains in the frequency from 0 to 2 kHz were measured in accordance with EN IEC 61000-3-2:2019+A1.

The measurement was conducted with an automatic current harmonic analyzing system. This equipment is in compliance with the requirements of EN IEC 61000-3-2:2019+A1.

The results indicated in the following tables and figures were those measured and recorded by an automatic measuring system.

Table 2: Harmonic currents measurement result

Equipment category: Class A;
Fundamental current: 10.745A; Power factor: 0.994; Active input power: 2552.0W.

Harm No.	Harm. Ave.	Harm. Limit (100%)	% Of Limits	Result (Ave.)	Result (Max.)	Harm. Win.	Harm. Win. (150%)	% Of Max
2	0.0035	1.0800	0.3	PASS	PASS	0.0169	1.6200	1.0
3	0.6421	2.3000	27.9	PASS	PASS	0.6694	3.4500	19.4
4	0.0020	0.4300	0.5	PASS	PASS	0.0109	0.6450	1.7
5	0.2144	1.1400	18.8	PASS	PASS	0.2221	1.7100	13.0
6	0.0017	0.3000	0.6	PASS	PASS	0.0057	0.4500	1.3
7	0.0596	0.7700	7.7	PASS	PASS	0.0728	1.1550	6.3
8	0.0021	0.2300	0.9	PASS	PASS	0.0045	0.3450	1.3
9	0.0374	0.4000	9.4	PASS	PASS	0.0397	0.6000	6.6
10	0.0010	0.1840	0.5	PASS	PASS	0.0032	0.2760	1.2
11	0.0083	0.3300	2.5	PASS	PASS	0.0127	0.4950	2.6
12	0.0009	0.1530	0.6	PASS	PASS	0.0026	0.2295	1.1
13	0.0114	0.2100	5.4	PASS	PASS	0.0134	0.3150	4.2
14	0.0011	0.1310	0.8	PASS	PASS	0.0023	0.1965	1.2
15	0.0135	0.1500	9.0	PASS	PASS	0.0148	0.2250	6.6
16	0.0007	0.1150	0.6	PASS	PASS	0.0017	0.1725	1.0
17	0.0082	0.1320	6.2	PASS	PASS	0.0104	0.1980	5.3
18	0.0011	0.1020	1.1	PASS	PASS	0.0020	0.1530	1.3
19	0.0068	0.1180	5.7	PASS	PASS	0.0076	0.1770	4.3
20	0.0016	0.0920	1.8	PASS	PASS	0.0024	0.1380	1.8
21	0.0068	0.1070	6.4	PASS	PASS	0.0075	0.1605	4.7
22	0.0009	0.0830	1.1	PASS	PASS	0.0016	0.1245	1.2
23	0.0057	0.0970	5.9	PASS	PASS	0.0061	0.1455	4.2
24	0.0017	0.0760	2.2	PASS	PASS	0.0031	0.1140	2.7
25	0.0042	0.0900	4.6	PASS	PASS	0.0051	0.1350	3.8
26	0.0047	0.0700	6.6	PASS	PASS	0.0097	0.1050	9.2
27	0.0035	0.0830	4.3	PASS	PASS	0.0045	0.1245	3.6
28	0.0029	0.0650	4.4	PASS	PASS	0.0058	0.0975	5.9
29	0.0032	0.0770	4.1	PASS	PASS	0.0041	0.1155	3.5
30	0.0019	0.0610	3.1	PASS	PASS	0.0039	0.0915	4.3
31	0.0018	0.0720	2.6	PASS	PASS	0.0028	0.1080	2.6
32	0.0013	0.0570	2.3	PASS	PASS	0.0024	0.0855	2.8
33	0.0018	0.0680	2.6	PASS	PASS	0.0023	0.1020	2.3
34	0.0010	0.0540	1.9	PASS	PASS	0.0020	0.0810	2.4
35	0.0014	0.0640	2.1	PASS	PASS	0.0019	0.0960	2.0
36	0.0007	0.0510	1.4	PASS	PASS	0.0011	0.0765	1.4
37	0.0012	0.0600	2.1	PASS	PASS	0.0018	0.0900	2.0
38	0.0005	0.0480	1.1	PASS	PASS	0.0010	0.0720	1.4
39	0.0015	0.0570	2.7	PASS	PASS	0.0028	0.0855	3.2
40	0.0005	0.0460	1.0	PASS	PASS	0.0009	0.0690	1.3

5.1.2 Voltage changes, voltage fluctuations and flicker on AC mains

Result:	**Pass**

Date of testing : 2023.08.18
Test procedure : EN 61000-3-3:2013+A1+A2
Ambient Condition : Temperature: 23 °C ; Relative Humidity: 68 %

According to the EN 61000-3-3:2013+A1+A2:

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

- the value of Pst shall not be greater than 1.0;
- the value of *d(t)* during a voltage change shall not exceed 3.3% for more than 500ms;
- the 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 3: Voltage fluctuations and flicker measurement results

	d_c	d_{max} *(average)*	*d(t)*	P_{st}	P_{lt}
Limits	3.3%	6%	3.3%/500ms	1.0	N/A
Result	0%	0.171%	0ms	0.434	N/A

5.1.3 Mains Terminal Continuous Disturbance Voltage

Result:	**Pass**

Date of testing	:	2023.08.14
Kind of test site	:	EMC Shielding Room
Port	:	Mains
Basic Standard	:	EN IEC 55014-1:2021
Frequency Range	:	150kHz – 30MHz
Limit	:	EN IEC 55014-1:2021, Clause 4.3.3 Table5
Ambient Condition	:	Temperature: 23 °C; Relative Humidity: 63 %

Test Setup

Input Voltage	:	AC 230V, 50Hz
Operational mode	:	ON
Earthing	:	Yes
Test Setup	:	According to Clause 5 of EN IEC 55014-1:2021

The measurement setup was made according to EN IEC 55014-1:2021 in an EMC shielding room.

The measurement equipment like test receiver, quasi-peak detector and Artificial Mains Network (AMN) are in compliance with CISPR 16-1 series standards and EN IEC 55014-1:2021. The tested object was operated under its rated voltage and its rated frequency. Prior to the measurements the test object operated about 15 minutes (warm-up) in order to stabilize its operating conditions and to ensure reliable measurement values.

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

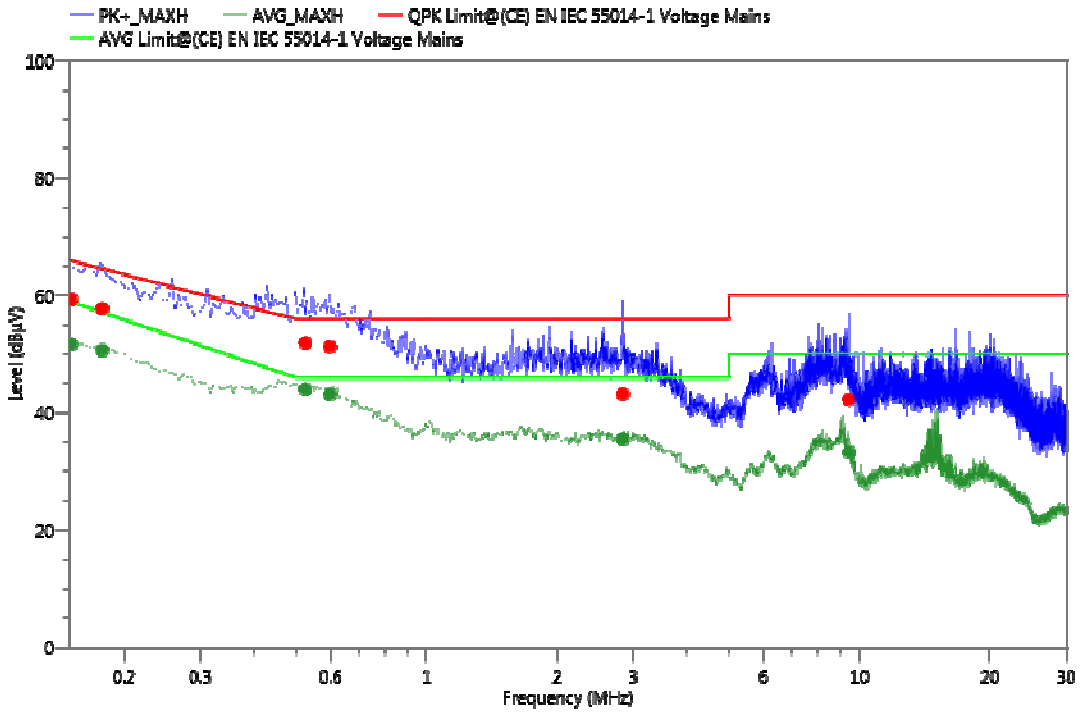
Before measurement, a survey was made to determine in which state the maximum disturbance was obtained. And the measurement was made in the state the maximum disturbance was obtained.

The tested object was set-up on a wooden table. The length of the power cord of the tested object was about 0.8m. The EUT was set 0.8m away from the AMN.

The Disturbance Voltage was determined according to clause 5 of EN IEC 55014-1:2021 while measuring the anode and cathode conductor by turns.

The following figures were those measured by an automatic measuring system. The disturbance voltage was scanned firstly with both Quasi-peak and Average detector and then a final measurement was performed with both Quasi-peak and Average detector at the frequencies which showed the Max. in a designated frequency sub-range. In the figures below, the higher curve is that of peak-value and the lower one is average-value. The symbol "♦" refers to Quasi-peak value and the Average value which were measured in the final measurement.

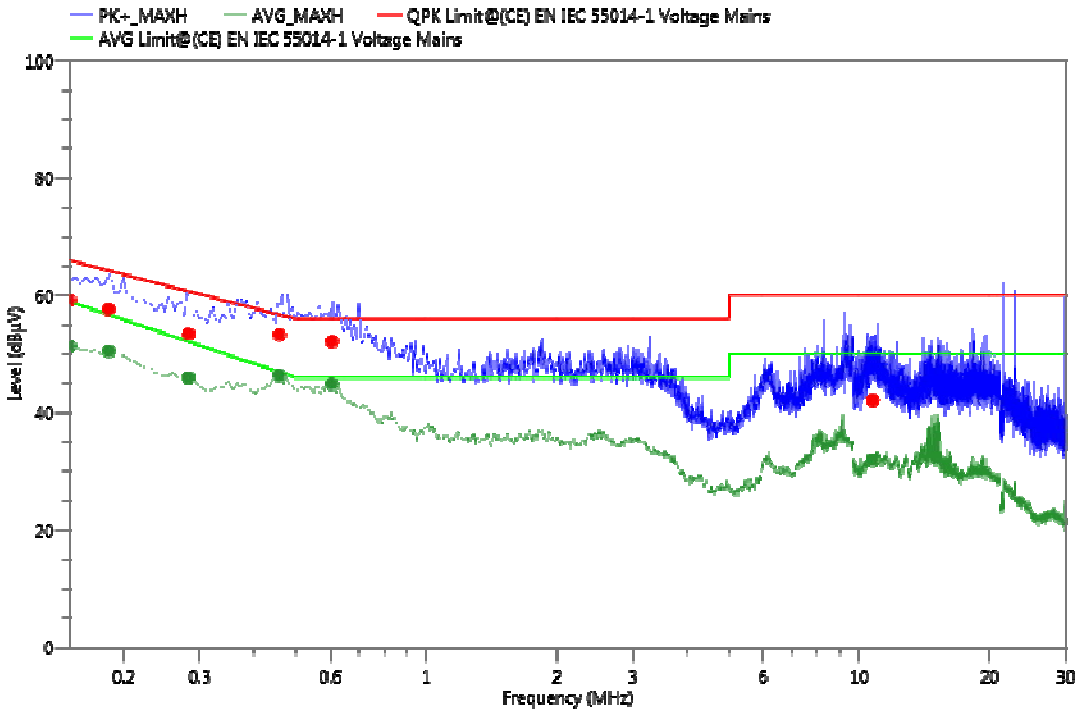
Figure 1: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, L



Final_Result(Margin=Limit-Meas.(Reading +Corr.))

No.	Freq. (MHz)	Reading (dBµV)	Meas. (dBµV)	Limit (dBµV)	Margin (dB)	Det.	Line	PE	Corr. (dB)	Verdict
1	0.151	49.42	59.32	65.94	6.62	QPK	L1	GND	9.9	PASS
2	0.151	41.76	51.66	58.93	7.27	AVG	L1	GND	9.9	PASS
3	0.178	47.74	57.77	64.58	6.81	QPK	L1	GND	10.03	PASS
4	0.178	40.65	50.68	57.15	6.47	AVG	L1	GND	10.03	PASS
5	0.525	41.69	51.91	56.00	4.09	QPK	L1	GND	10.22	PASS
6	0.525	33.80	44.02	46.00	1.98	AVG	L1	GND	10.22	PASS
7	0.597	41.00	51.26	56.00	4.74	QPK	L1	GND	10.26	PASS
8	0.597	32.83	43.09	46.00	2.91	AVG	L1	GND	10.26	PASS
9	2.836	32.54	43.13	56.00	12.87	QPK	L1	GND	10.59	PASS
10	2.836	24.85	35.44	46.00	10.56	AVG	L1	GND	10.59	PASS
11	9.476	31.42	42.24	60.00	17.76	QPK	L1	GND	10.82	PASS
12	9.476	22.43	33.25	50.00	16.75	AVG	L1	GND	10.82	PASS

Figure 2: Spectral Diagrams, Conducted Emission, 150kHz - 30MHz, N



Final_Result(Margin=Limit-Meas.(Reading +Corr.))

No.	Freq. (MHz)	Reading (dBµV)	Meas. (dBµV)	Limit (dBµV)	Margin (dB)	Det.	Line	PE	Corr. (dB)	Verdict
1	0.150	49.24	59.18	66.00	6.82	QPK	N	GND	9.94	PASS
2	0.150	41.43	51.37	59.00	7.63	AVG	N	GND	9.94	PASS
3	0.185	47.56	57.63	64.26	6.63	QPK	N	GND	10.07	PASS
4	0.185	40.48	50.55	56.74	6.19	AVG	N	GND	10.07	PASS
5	0.282	43.27	53.40	60.76	7.36	QPK	N	GND	10.13	PASS
6	0.282	35.85	45.98	52.18	6.20	AVG	N	GND	10.13	PASS
7	0.458	43.09	53.28	56.73	3.45	QPK	N	GND	10.19	PASS
8	0.458	36.18	46.37	46.95	0.58	AVG	N	GND	10.19	PASS
9	0.606	41.91	52.18	56.00	3.82	QPK	N	GND	10.27	PASS
10	0.606	34.64	44.91	46.00	1.09	AVG	N	GND	10.27	PASS
11	10.761	31.32	42.14	60.00	17.86	QPK	N	GND	10.82	PASS
12	10.761	21.09	31.91	50.00	18.09	AVG	N	GND	10.82	PASS

5.1.4 Discontinuous Interference on AC Mains

Result:	Pass

Date of testing	:	2023.08.14
Test procedure	:	EN IEC 55014-1:2021 and CISPR 16-1 series standards
Kind of test site	:	EMC shielded room
Port	:	Mains
Basic standard	:	EN IEC 55014-1:2021
Frequency range	:	0.15 – 30MHz
Limit	:	EN IEC 55014-1:2021, clause 4.4
Operating Condition	:	EN IEC 55014-1:2021, clause A.4
Ambient Condition	:	Temperature: 21 °C ; Relative Humidity: 69 %

Measuring configuration and description

The discontinuous interference on AC mains in the frequency range from 0.15 to 30MHz was measured in accordance to EN IEC 55014-1:2021.

The measurement setup was made according to EN IEC 55014-1:2021. The used measurement equipment was in accordance to CISPR 16-1 series standards.

The test setup is according to clause A.4 of EN IEC 55014-1:2021.

The clicks were measured when the thermostat of the EUT started or stopped.

The clicks were measured at the frequency of 0.15MHz, 0.5MHz, 1.4MHz and 30MHz.

The tests include RUN A and RUN B. The first one is to detect the Click rate and RUN B is to detect how many clicks overtop the limits that are calculated according the formula below.

For $0.2 \leqslant N<30$ the Sensitivity = RUN A + 20*log(30/Click rate) and for $N<0.2$ the Sensitivity = RUN A + 44.

Table 4: Click Test Results of RUN A

Measured Frequency (MHz)	0.15	0.5	1.4	30
Sensitivity(dBuV)	66.0	56.0	56.0	60.0
Last Time T(min./sec.)	120	120	120	120
Short Click Number n1	34	17	0	0
Long Click Number n2	6	0	0	0
Total Click Number n=n1+n2	40	17	0	0
Click Rated N=F x n/T	0.33	0.14	0.14	0.14

Table 5: Click Test Results of RUN B

Measured Frequency (MHz)	0.15	0.5
New limit Lq (dBuV)	105.17	102.62
Allowed clicks	0	0
Click Number n1 of <20ms	0	0
Click Number n2 of >20ms	0	0
Total Click Number n=n1+n2	0	0

According to the EN IEC 55014-1:2021:

“ - The appliance is assessed for compliance with the higher limit Lq in accordance with the upper quartile method, the appliance being tested for a time not less than the minimum observation time T.”

Therefore this model is deemed to fulfill the relevant requirements.

5.2 Emission in the Frequency Range above 30 MHz

5.2.1 Disturbance Power

Result:	**Pass**

Date of testing	:	2023.08.14
Port	:	Mains
Basic Standard	:	EN IEC 55014-1:2021
Frequency Range	:	30 – 300MHz
Limit	:	EN IEC 55014-1:2021, clause 4.3.4.4
Ambient Condition	:	Temperature: 24 °C ; Relative Humidity: 70 %

Test Setup

Input Voltage	:	AC 230V, 50Hz
Operational mode	:	ON
Earthing	:	Yes

Measuring configuration and description

The measurement setup was made according to EN IEC 55014-1:2021.

The measurement equipment like test receivers and absorption clamp are in compliance with CISPR 16-1 series standards. The test object has been operated by its rated voltage, rated frequency. Prior to the measurements the test objects operated about 10 minutes (warm-up) in order to stabilize their operating conditions and to ensure reliable measurement values.

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

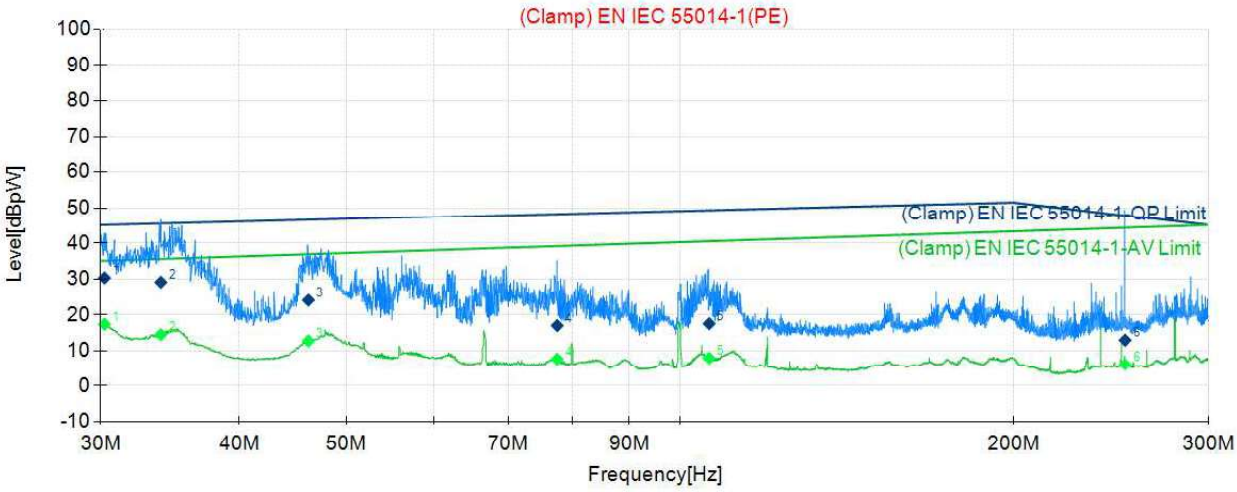
Before measurement, a survey was made to determine in which state the maximum disturbance was obtained. And the measurement was made in the state the maximum disturbance was obtained.

The tested object was set-up on a wooden bench.

The Disturbance Power was determined according to clause 6 of EN IEC 55014-1:2021. The length of power cord of EUT plus that of the extension cord was 6.0 m.

The measurement was performed by operating the EUT in normal operation mode. The figures and tables below were those measured in the operation mode. Both Quasi Peak and Average Value were measured. In final measurement, by moving the absorption clamp along the power supply cord and the extension-power cord from the test object, Quasi-Peak and Average Value were measured and listed respectively where they had a maximum in previous scanning survey. In the Figures, the symbol “+” with blue colour means Average Value and the symbol “×” with red colour means Quasi-Peak Value which was measured in final measurement.

Figure 3: Spectral Diagrams, Power Disturbance, Mains, 30–300MHz



Final Data List

NO.	Freq. [MHz]	Factor [dB]	QP Reading [dBpW]	QP Value [dBpW]	QP Limit [dBpW]	QP Margin [dB]	AV Reading [dBpW]	AV Value [dBpW]	AV Limit [dBpW]	AV Margin [dB]	Verdict
1	30.240	26.25	4.07	30.32	45.03	14.71	-8.89	17.36	35.03	17.67	PASS
2	34.000	26.98	2.12	29.10	45.43	16.33	-12.48	14.50	35.54	21.04	PASS
3	46.200	26.52	-2.45	24.07	46.48	22.41	-13.76	12.76	36.88	24.12	PASS
4	77.480	23.46	-6.46	17.00	48.25	31.25	-15.80	7.66	39.12	31.46	PASS
5	106.240	24.57	-7.04	17.53	49.33	31.80	-16.61	7.96	40.49	32.53	PASS
6	252.120	24.07	-11.11	12.96	47.79	34.83	-17.99	6.08	44.24	38.16	PASS

5.2.2 Radiated Disturbance in the Frequency Range from 30MHz to 1000MHz

Result:	**Pass**

Port : Enclosure
Basic Standard : EN IEC 55014-1:2021
Frequency Range : 30-1000MHz
Limit : EN IEC 55014-1:2021, clause 4.3.4.5, Table 9.

According to a) of the clause 4.3.4.2 of EN IEC 55014-1:2021:
"Appliances are deemed to comply in the frequency range from 300MHz to 1000MHz if both of the following conditions 1) and 2) are fulfilled:"
1): the disturbance power emission from the EUT is lower than the limits of Table 7 reduced by the values of Table 8
2): the maximum clock frequency shall be less than 30MHz.

Because the EUT meets the two conditions mentioned above, the EUT is deemed to meet the radiated requirements without actual testing.

6 Test Results I M M U N I T Y

According to the electrical characteristics above and EN IEC 55014-2:2021, the EUT belongs to category II equipment.

"Category II: mains operated equipment containing electronic control circuitry with no clock frequency higher than 15 MHz."

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

Performance criterion A: The apparatus shall continue to operate as intended during the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended.

Performance criterion B: The apparatus shall continue to operate as intended after the test. No degradation of performance or loss of function is allowed below a performance level (or permissible loss of performance) specified by the manufacturer, when the apparatus is used as intended. During the test, degradation of performance is allowed.

Performance criterion C: Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by the operation of the controls, or by any operation specified in the instructions for use.

Date of testing: 2023.08.18

Room temperature	:	23°C
Relative humidity	:	58-68% (58% for ESD room)
Atmospheric pressure	:	101 kPa

6.1 Enclosure

6.1.1 Electrostatic Discharge

Result:	**Pass**

The immunity against electrostatic discharge was tested in accordance with EN IEC 55014-2:2021. Test setup and ESD-Generator are according to EN 61000-4-2 which is specified by EN IEC 55014-2:2021.

The EUT is placed on 0,1m wood table above the ground plane. And the minimum distance between the EUT and all other conductive structures except the ground plane beneath the EUT is more than 0,5m.

The reference ground plane is an aluminium sheet of 0.25mm minimum thickness. The reference ground plane is connected to the protective earth. The size of the ground plane is 2m × 2m.

A horizontal coupling plane (HCP), 1.6m × 0.8m, is placed on the table and isolated from the EUT and cables by an insulating support 0.5mm thick. Vertical coupling plane (VCP) of dimensions 0.5m × 0.5m is placed parallel to and positioned at a distance of 0.1m from the EUT.

Charge voltage	:	±4.0kV (Contact Discharge), ±8.0kV (Air Discharge)
Polarity	:	positive / negative
Number of discharges	:	≥10
Performance criteria	:	B

Table 6: ESD, Positive / Negative Polarity

Position	Kind of Discharge	Result	Remarks
Nonmetal Enclosure	Air discharge ±8kV	Pass	No disturbance of function
Display	Air discharge ±8kV	Pass	No disturbance of function
Metal Enclosure	Contact discharge ±4kV	Pass	No disturbance of function
Coupling plane (Both HCP and VCP)	Contact discharge ±4kV	Pass	No disturbance of function

6.2 Input and Output AC Power Ports

6.2.1 Fast Transients on AC Power Lines

Result:	**Pass**

The immunity against fast transients on AC power lines was tested in accordance to EN IEC 55014-2:2021. Test setup and the fast transient noise generator are according to EN 61000-4-4 which is specified by EN IEC 55014-2:2021.

The EUT is placed on 0.1m wood table above the ground plane. And the minimum distance between the EUT and all other conductive structures except the ground reference plane is more than 0.5m.

The length between the coupling device and the EUT is less than 1m. The cord length more than 1m, the excess length of the cable shall gathered into a flat coil with a 0,4m diameter, and situated at a distance of 0,1m above the ground reference plane.

The reference ground plane is an aluminium sheet of 0.25mm minimum thickness. The reference ground plane is connected to the protective earth. The size of the ground plane is 2m × 2m.

Test Voltage	:	1kV
Polarity	:	negative/positive
Repetition frequency	:	5kHz
Test duration	:	≥120sec
Tr/Tn	:	5ns/50ns
Performance criteria	:	B

Table 7: Burst, AC Power lines, Positive and Negative Polarity

Coupling Method: Direct Injection			
Coupling Port	Test Voltage / Result		Remark
AC mains: L1 (L), L2 (N), PE	±1000V	Pass	No disturbance of function

6.2.2 Injected Current into AC Power Port

Result:	**Pass**

The immunity against injected current into AC power port was tested according to EN IEC 55014-2:2021 in a shielded room. The Test setup and the test generator are according to EN 61000-4-6 which is specified by EN IEC 55014-2:2021.

The EUT is placed on 0,1m wood table above the ground plane. And the minimum distance between the EUT and all other conductive structures except the reference ground plane is more than 0.5m.

The EUT comprised a single unit. The coupling and decoupling networks were inserted on the power supply connection. The coupling and decoupling networks was placed on the ground reference plane, making direct contact with it at about 0.1-0.3 meter from EUT. The cable between EUT and CDN is as short as possible and not bundled nor wrapped. The height of cable between the EUT and the coupling and decoupling networks above the ground reference plane was 50mm.

Voltage Level	:	3V(rms)(unmodulated)
Environmental phenomena	:	r.f. current, common mode, 1kHz, 80%AM
Source impedance	:	150 Ω
Frequency range	:	0.15 - 230 MHz
Sweeping rate	:	$\leq 1{,}5 \times 10^{-3}$ decades/s
Performance criteria	:	A

Table 8: Injected current, AC Power Port

Coupling Port	Coupling Method:	Result	Remark
AC mains: L1 (L), L2 (N), PE	CDN M-3	Pass	No disturbance of function

6.2.3 Surges to AC Power Port

Result:	**Pass**

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 EN 61000-4-5 which is specified by EN IEC 55014-2:2021.

Open-circuit Test Voltage	:	1 kV (phase to neutral)/2 kV (Phase/neutral to PE)
Tr/Tn	:	1.2/50μs (open-circuit voltage) 8/20μs (short-circuit current)
Test numbers	:	5 positive and 5 negative pulses
Test angle	:	90° and 270°
Repetition rate	:	1 surge/min
Performance criteria	:	B

Table 9: Surges to AC Power lines, positive/negative

Line	Test Voltage/coupling phase	Result	Remarks
Phase to neutral	+1.0kV, +π/2(5 times)	Pass	No disturbance of function
	-1.0kV, -π/2(5 times)	Pass	No disturbance of function
Phase/neutral to PE	+2.0kV, +π/2(5 times)	Pass	No disturbance of function
	-2.0kV, -π/2(5 times)	Pass	No disturbance of function

6.2.4 Voltage dips and interruptions to AC Power Port

Result:	**Pass**

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

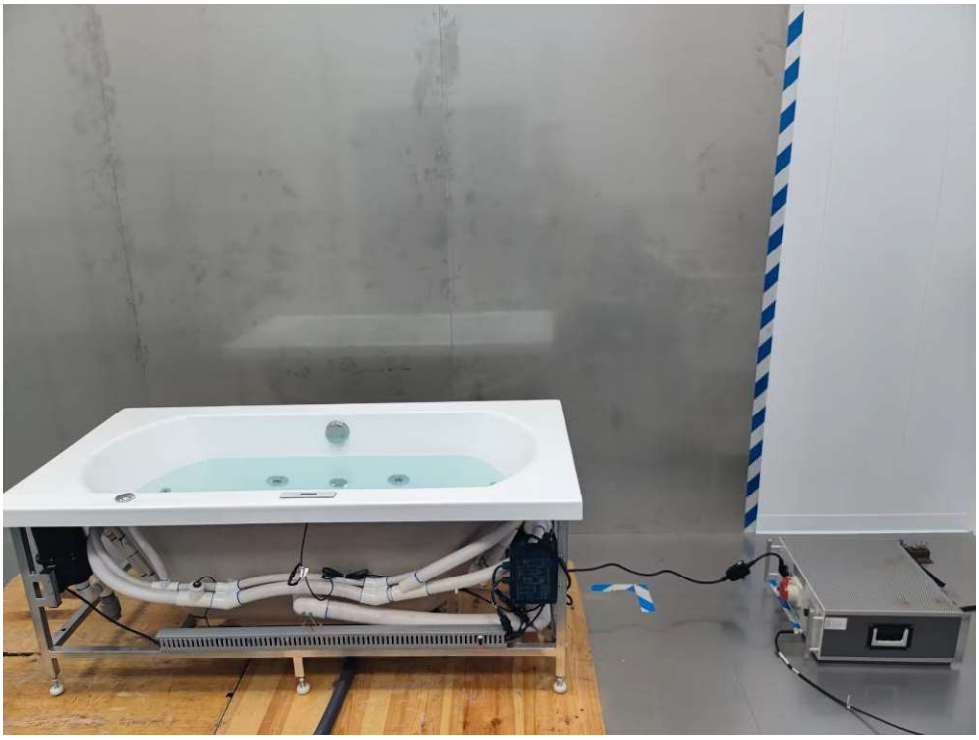
Performance criteria	:	C	
Test level (in % UT) and	:	0	0.5 periods(50Hz)
duration (in periods of the		40	10 periods(50Hz)
rated frequency)		70	25 periods(50Hz)

Table 10: Test condition and Test Result for Voltage dips and Short interruptions

Test level (in % UT)	Duration	Performance criteria	Result	Remarks
0	0.5	C	Pass	No disturbance of function
40	10	C	Pass	No disturbance of function
70	25	C	Pass	No disturbance of function

7 Photographs of the Test Set-Up

Photograph 1: Set-up for Disturbance Voltage



Photograph 2: Set-up for Disturbance Power

Photograph 3: Set-up for ESD

Photograph 4: Set-up for EFT

Photograph 5: Set-up for Surge

Photograph 6: Set-up for Dips

Photograph 7: Set-up for Injected Current

Photograph 8: Set-up for Harmonic and Voltage Fluctuation and Flicker

Photograph 9: Set-up for Click

8 List of Tables

9 List of Figures

10 List of Photographs

-- The END --