

Test Report

Report No. : HA0124NB062026EM-R1
Applicant : Ningbo Zhongdi Industry & Trade Co., Ltd.
Address : Jishigang Industry Zone, Haishu District, Ningbo 315171, P. R. China
Trade Mark(s) : ZD
Manufacturer : Same as the applicant
Address : Same as the applicant
Manufacturing site : Same as the applicant
Address : Same as the applicant

Equipment Under Test (EUT):

EUT Name : Soldering Iron
Model/Type No. : ZD-20K, ZD-20K-1
Standards : Refer to page 2
Date of Receipt : June 17, 2024 (Based on original report HA0124NB062026EM)
Date of Test : June 19, 2024 to July 15, 2024 (Based on original report HA0124NB062026EM)
Date of Issue : September 14, 2024
Test Result : **PASS***

Prepared By:

Ningbo HATEK Co., Ltd.

6F, No. 65, Mujin Road, National Hi-Tech Zone, Ningbo, Zhejiang 315013, China

Tel: +86-574-87171888 E-mail: info@hatek.com.cn

Prepared By



Bill Dong

Engineer

Reviewed By



Miise xie

Technical Manager



*The test results have been reviewed against the Directives above and found to meet their essential requirement. The results shown in this test report refer only to the sample(s) tested. This document cannot be reproduced except in full, without prior written approval of HATEK.

1 Test Summary

1.1 Test Items

Test Items	Result
Disturbance Voltage on Mains Terminal 0.15MHz- 30MHz	P
Discontinuous Disturbance Voltage/Click	P
Continuous Disturbance Power, 30MHz - 300MHz	N/A
Radiation Emission, 30MHz - 1000MHz	P
Harmonic Current	P
Voltage Fluctuations-Flicker	P
ESD	P
Radiated Immunity (80MHz - 1GHz)	N/A
Electrical Fast Transients (EFT)	P
Surge Immunity	P
Injected Currents, 0.15MHz - 230MHz	P
Voltage Dips and Interruptions	P
Remark:	P: Pass/ F: Fail/ N/A: Not Applicable

1.2 Test Specification

The equipment(s) comply with the requirements according to the following standards:

EN IEC 55014-1:2021 Electromagnetic compatibility-Requirements for household appliances, electric tools and similar apparatus Part1: Emission;

EN IEC 55014-2:2021 Electromagnetic compatibility-Requirements for household appliances, electric tools and similar apparatus Part2: Immunity;

EN IEC 61000-3-2:2019+A1:2021: Limits for harmonic current emissions (equipment input current ≤ 16 A per phase);

EN 61000-3-3:2013+A1:2019+A2:2021: Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current ≤ 16 A per phase and not subject to conditional connection.

Contents

	Page
1 TEST SUMMARY.....	2
1.1 Test Items.....	2
1.2 Test Specification.....	2
2 GENERAL INFORMATION.....	4
2.1 Client Information.....	4
2.2 General Description of E.U.T.....	4
2.3 Identifies and differences:.....	4
2.4 Environment.....	4
2.5 Submitted Documents.....	4
3 TEST FACILITY AND INSTRUMENT LIST.....	5
3.1 Test Facility.....	5
3.2 Instrument list.....	5
3.3 Measurement Uncertainty.....	6
4 TEST RESULTS EMISSION.....	7
4.1 Emission in the Frequency Range from 0 kHz to 30 MHz.....	7
4.1.1 <i>Harmonics on AC Mains</i>	7
4.1.2 <i>Voltage changes, voltage fluctuations and flicker on AC mains</i>	8
4.1.3 <i>Mains Terminal Continuous Disturbance Voltage</i>	9
4.1.4 <i>Discontinuous Interference on AC Mains</i>	13
4.2 Emission in the Frequency Range from 30 MHz to 1000 MHz.....	15
4.2.1 <i>Radiated disturbance</i>	15
5 TEST RESULTS IMMUNITY.....	21
5.1 Enclosure.....	22
5.1.1 <i>Electrostatic Discharge</i>	22
5.2 Input and Output AC Power Ports.....	23
5.2.1 <i>Fast Transients on AC and DC Power Lines</i>	23
5.2.2 <i>Injected Current into AC Power Port</i>	24
5.2.3 <i>Surges to AC Power Port</i>	25
5.2.4 <i>Voltage dips and interruptions to AC Power Port</i>	26
6 PHOTOGRAPHS OF THE EUT.....	27
7 LIST OF TABLES.....	35
8 LIST OF FIGURES.....	35
9 LIST OF PHOTOGRAPHS.....	35

2 General Information

2.1 Client Information

Applicant : Ningbo Zhongdi Industry & Trade Co., Ltd.

Address : Jishigang Industry Zone, Haishu District, Ningbo 315171, P. R. China

2.2 General Description of E.U.T.

Rated input : DC 5V, 8W for Shortest Length Heating Element
DC 5V, 8W for Medium Length Heating Element
DC 5V, 12W for Longest Length Heating Element
Input of Adapter: AC 100-240V, 50/60Hz, 0.45A Max
Output of Adapter: DC 5V, 7.5W, 1.5A

Protection class : Class II

2.3 Identifies and differences:

HA0124NB062026EM-R1 report:

The original test report HA0124NB062026EM, issued on July 16, 2024 was modified.

As required by client, add new model ZD-20K-1 in this report.

In electrical characteristics, added model ZD-20K-1 are the same to original models ZD-20K respectively except for appearance.

The samples have been received and checked. According to the contents of update, no additional test is needed.

2.4 Environment

- Residential (domestic) environment
- Commercial and light-industrial environment
- Industrial environment
- Medical environment.

2.5 Submitted Documents

Constructional Data Form for EMC

Circuit diagram, user's manual, labels and construction drawings etc.

3 Test Facility and Instrument list

3.1 Test Facility

All the tests done in this report are subcontracted to Shenzhen Most Technology Service Co., Ltd. (No.5, 2nd Langshan Road, North District, Hi-tech Industrial Park, Nanshan, Shenzhen, Guangdong, China)

3.2 Instrument list

Table 1: List of Test and Measurement Equipment of Laboratory

Shielding Room - Disturbance Voltage Test				
Equipment	Manufacturer	Model	Serial No.	Due Date
Receiver	R&S	ESR3	102043	08/24/2025
LISN	R&S	ENV216	102058	08/24/2025
Absorbing Clamp	R&S	MDS21	100789	06/09/2025
ESD Simulator	EM-TEST	ESD 30N	P1526159867	11/17/2024
3M Chamber & Accessory Equipment	TDK	SAC-3	----	---
Signal Generator	R&S	SMB100A	179680	08/24/2025
Stacked double Log.-Per. Antenna	R&S	HL046E	-----	N/A
Power Amplifier	R&S	BBA150-BC1000	102131	08/24/2025
Power Amplifier	BONN	1060-400/100D	1610682	N/A
Stacked Double Log-Per Antenna	SCHWARZBEC K	STLP9149	9149435	N/A
Compact Generator	EM-TEST	UCS500N7	P1608172945	08/24/2025
coupling/decoupling network	EM-TEST	CNI503B7	P1626181212	08/24/2025
Motorized Variac	EM-TEST	MV2616	P1532162313	08/24/2025
Signal Generator	R&S	SMC100A	105636	08/24/2025
Power Amplifier	R&S	BBA150A200 B250	102124	08/24/2025
Attenuator	Bird	300-A-FFN-06	1617	08/24/2025
CDN	FCC	FCC-801-M2/M3-16A	170209	08/24/2025
Harmonic & Flicker System	EM-TEST	DPA 503N& AIF 503N32.1	P1545166605 & P1613178045	08/24/2025
Muitifunction AC/DC Power Source	EM-TEST	NetWave 30-400	P1613178144	08/24/2025

3.3 Measurement Uncertainty

Conducted Emission (9-150KHz)	:	U = 3.6 dB
Conducted Emission (150K-30MHz)	:	U = 3.6 dB
Disturbance Power	:	U = 3.6 dB
Radiated Emission (30-1000MHz)	:	U = 4.5 dB
Radiated Emission (1- 6GHz)	:	U = 5.5dB
Expanded Measurement Uncertainty (K=2)		



4 Test Results EMISSION

4.1 Emission in the Frequency Range from 0 kHz to 30 MHz

4.1.1 Harmonics on AC Mains

General test information

Temperature	: 25°C
Relative Humidity	: 51 %RH
Test procedure	: EN IEC 61000-3-2:2019+A1:2021
Test duration	: 2.5min
Harmonic order	: 2 – 40 th
Frequency range	: 0 – 2kHz
Test result	: Pass

Block Diagram of Test Set up



Test Procedure

The harmonics on AC Mains in the frequency from 0 to 2 kHz were measured in accordance with EN IEC 61000-3-2:2019+A1:2021.

The measurement of Harmonics of the fundamental current were measured up to 40 order harmonics using a digital power meter with an analogue output and frequency analyser which was integrated in the harmonic & flicker test system. This equipment is in compliance with the requirements of EN IEC 61000-3-2:2019+A1:2021.

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

Test Results:

According to the Clause 7 in the EN IEC 61000-3-2:2019+A1:2021

For the following categories of equipment, limits are not specified in this standard:

– equipment with a rated power of 75 W or less, other than lighting equipment;

This product is not defined as lighting equipment, and has rated power less than 75W, therefore, no limit apply according to EN 61000-3-2.

4.1.2 Voltage changes, voltage fluctuations and flicker on AC mains

General test information

Test procedure : EN 61000-3-3:2013+A1:2019+A2:2021
 Temperature : 25°C
 Relative Humidity : 51 %RH
 Test result : Pass

Block Diagram of Test Set up



Test Procedure

According to the A.10 of the EN 61000-3-3:2013+A1:2019+A2:2021:

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

- the value of P_{st} shall not be greater than 1.0;
- the value of P_{lt} shall not be greater than 0.65;
- 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 4%.

The measurement was carried in accordance with Annex B of the basic standard and the EUT was set to produce the most unfavorable sequence of voltage changes.

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

Table 2: Voltage fluctuations and flicker measurement results

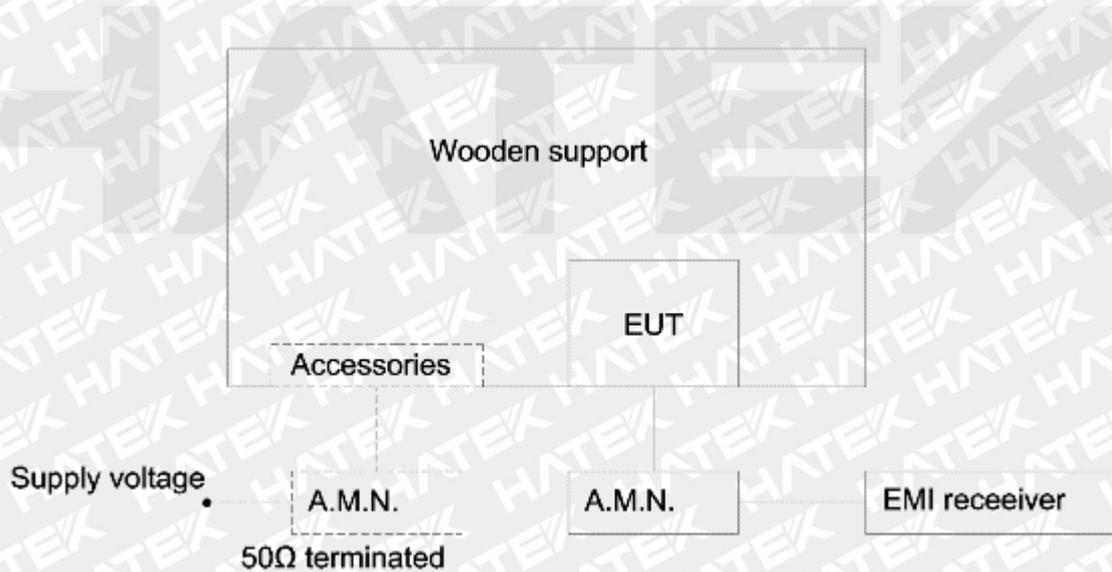
	d_c	$d_{max}(average)$	$d(t)$	P_{st}	P_{lt}
Limits	3.3%	4%	3.3%/500ms	1.0	N/A
Result	0.00%	0.00%	0.00ms	0.03	-

4.1.3 Mains Terminal Continuous Disturbance Voltage

General test information

Test procedure : EN IEC 55014-1:2021 and CISPR 16-1 series standards
Frequency range : 0.15-30MHz
Kind of test site : EMC Chamber
Temperature : 25 °C
Relative Humidity : 51 %RH
Operational condition : Charging+ normal operation
Artificial hand : Yes
Earthing : Through artificial hand to AMN.
Test result : Pass

Block Diagram of Test Set up



- For table top equipment, wooden support is 0.8m height.
- For floor standing equipment, wooden support is 0.1m height.

Test Procedure

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

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.

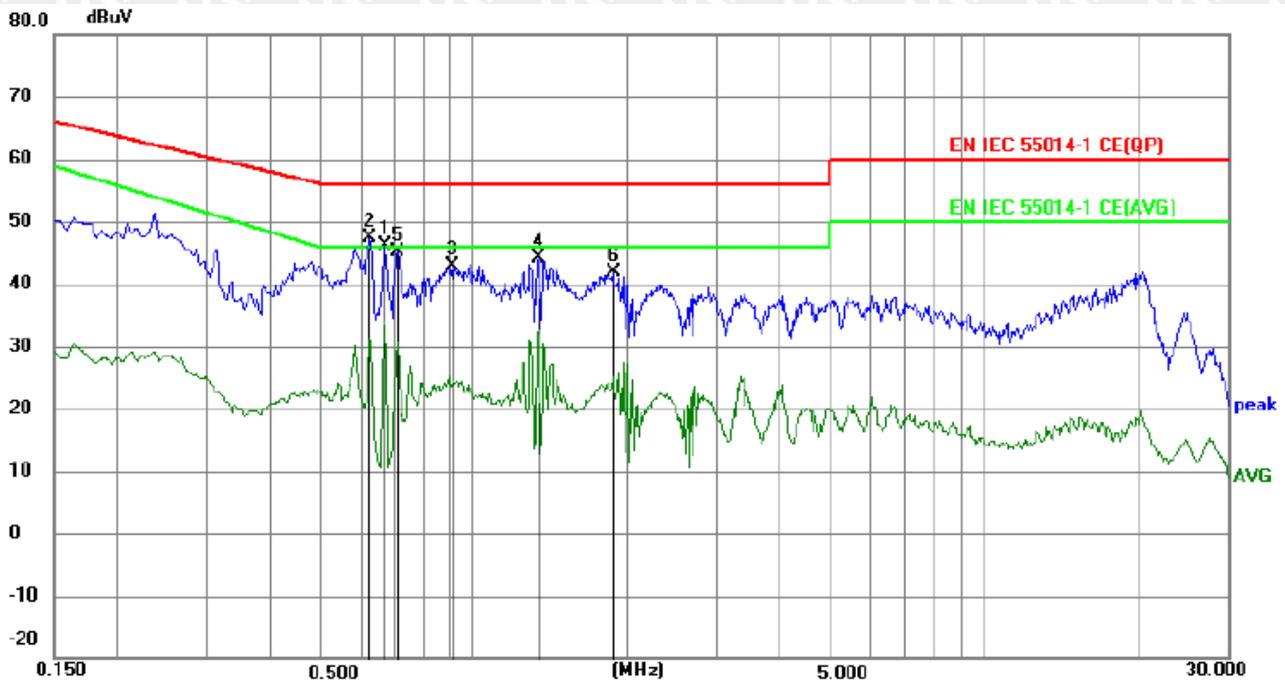
Furthermore an internal calibration with the test receiver was conducted prior to each measurement. And the measurement was made in the state the maximum disturbance was obtained.

The tested object was set-up on a wooden table. The length of the power cord of the tested object was about 1.5m. The EUT was set 0.8m 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 0.3m and 0.4m. The EUT (Equipment under Test) was wrapped with artificial hand that was earthed through the Artificial Mains Network (AMN).

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

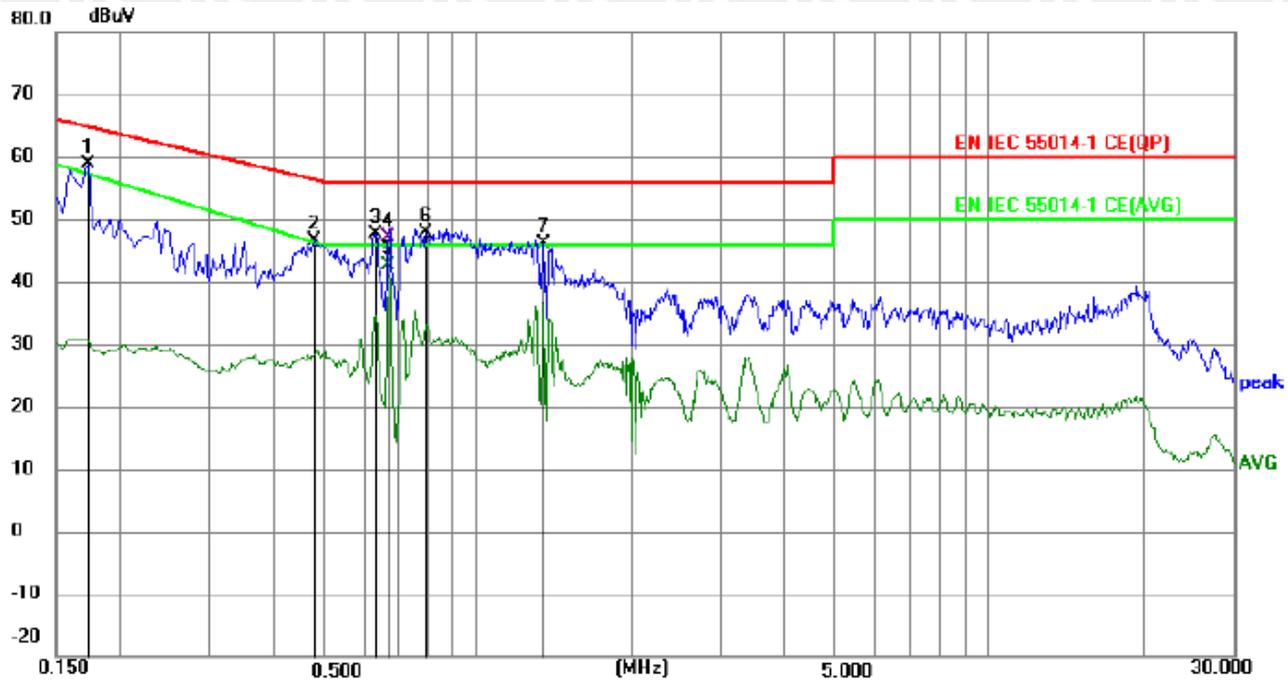
In the Figures, the symbol “+” means Quasi-Peak Value and the symbol “x” means Average Value which was measured in final measurement.

Figure 1: Test Curve of Conducted Emission in the frequency range of 150kHz - 30MHz, L line



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.6675	36.58	9.55	46.13	56.00	-9.87	peak	P
2 *	0.6225	37.74	9.54	47.28	56.00	-8.72	peak	P
3	0.9060	33.42	9.56	42.98	56.00	-13.02	peak	P
4	1.3335	34.51	9.56	44.07	56.00	-11.93	peak	P
5	0.7080	35.59	9.55	45.14	56.00	-10.86	peak	P
6	1.8690	32.35	9.56	41.91	56.00	-14.09	peak	P

Figure 2: Test Curve of Conducted Emission in the frequency range of 150kHz - 30MHz, N line



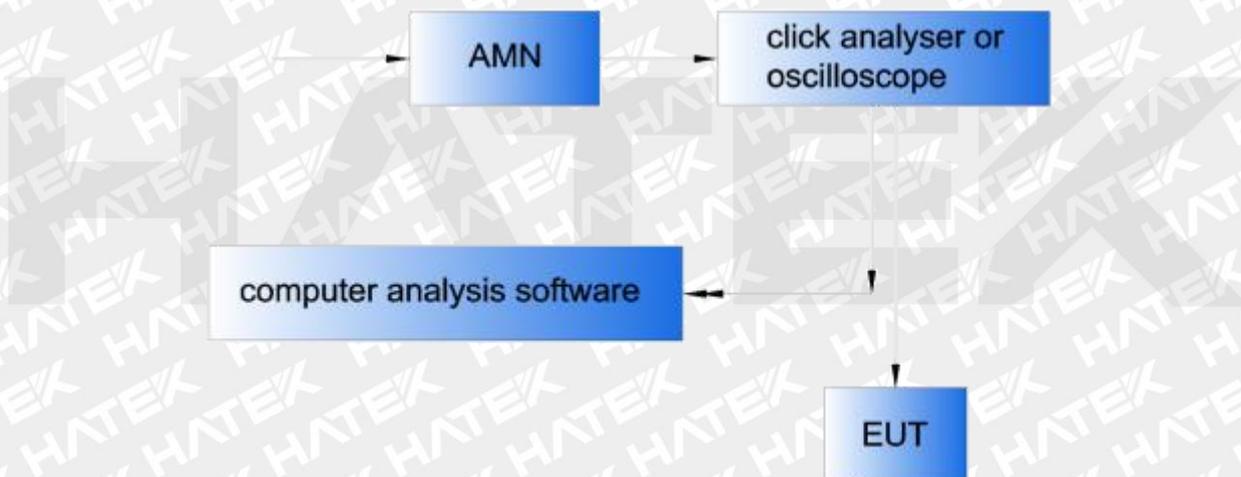
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1725	49.37	9.52	58.89	64.84	-5.95	peak	P
2	0.4785	37.02	9.54	46.56	56.37	-9.81	peak	P
3	0.6315	38.14	9.56	47.70	56.00	-8.30	peak	P
4	0.6677	37.50	9.56	47.06	56.00	-8.94	QP	P
5 *	0.6677	33.07	9.56	42.63	46.00	-3.37	AVG	P
6	0.7935	38.37	9.56	47.93	56.00	-8.07	peak	P
7	1.3470	36.62	9.56	46.18	56.00	-9.82	peak	P

4.1.4 Discontinuous Interference on AC Mains

General test information

Frequency range	: 0.15-30MHz
Kind of test site	: EMC Chamber
Temperature	: 25°C
Relative Humidity	: 51 %RH
Operational condition	: ON
Port	: EN IEC 55014-1:2021
Limit	: EN IEC 55014-1:2021
Test result	: Pass

Block Diagram of Test Set up



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

The measurement setup was made according to EN IEC 55014-1:2021, clause 4.2 in an shielding room. The used measurement equipment was in accordance to CISPR 16-1 series standards.

The test setup is according to clause 7.3.4.2 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 $0.2 \leq N < 30$ the Sensitivity = RUN A + $20 \cdot \log(30/\text{Click rate})$ and for $N < 0.2$ the Sensitivity = RUN A + 44.

Table 3: 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.)	60	60	60	60
Short Click Number n1	40	30	19	0
Long Click Number n2	0	0	2	0
Total Click Number n=n1+n2	40	30	21	0
Click Rated $N=F \times n/T$	0.22	0.21		

According to the clause 5.4.3.4 of EN IEC 55014-1:2021:

“ - the click rate is not more than 5,
- none of the caused clicks has a duration longer than 20ms,
- 90% of the caused clicks have a duration less than or equal 10ms
shall be verified at one frequency only, 150kHz or 500kHz, at which the higher click rate occurs. If any of these conditions is not satisfied then general assessment in accordance with 5.4.2 applies.”

Therefore this model is deemed to fulfill the relevant requirements.

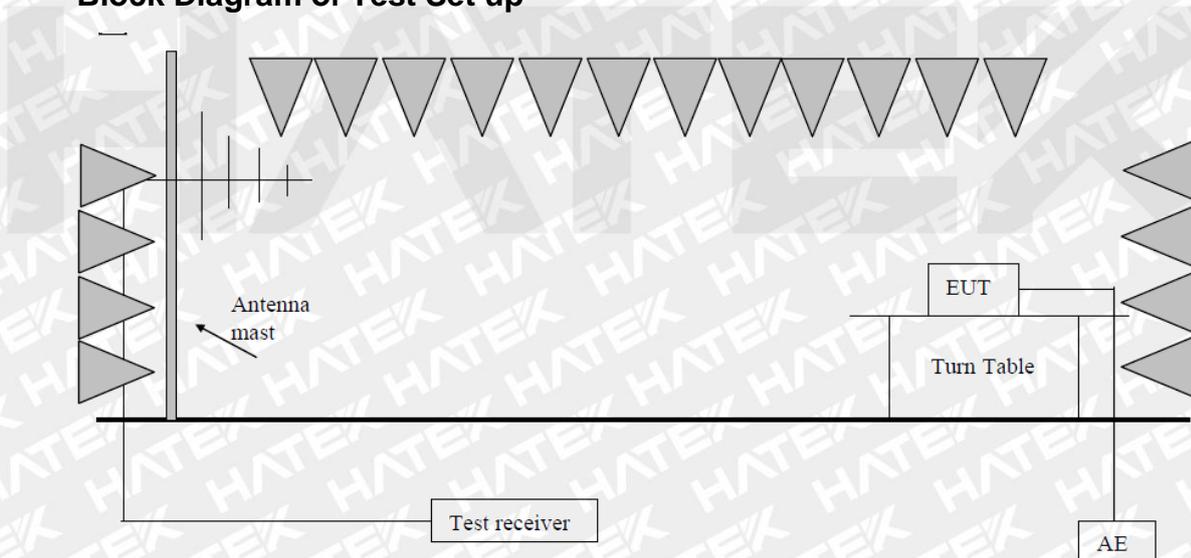
4.2 Emission in the Frequency Range from 30 MHz to 1000 MHz

4.2.1 Radiated disturbance

General test information

Frequency Range	: 30 – 1000MHz
Kind of test site	: EMC Chamber
Temperature	: 25 °C
Relative Humidity	: 51 %RH
Operational condition	: Charging+ normal operation
Port	: Mains
Limit	: EN IEC 55014-1:2021, Table 3, Household and similar appliances
Test result	: Pass

Block Diagram of Test Set up



- For table top equipment, wooden support is 0.8m height.
- For floor standing equipment, wooden support is 0.1m height.

Measuring configuration and description

The measurement was applied in a semi-anechoic chamber. Measurement was performed according to CISPR 22. Setting of EUT is according to clause 7 of EN 55014-1. The bandwidth setting on Test Receiver was 120kHz. The frequency range from 30MHz to 1000MHz was checked.

The radiated disturbance test was performed in a 3m semi-anechoic chamber. The test distance is 3m. The 10m radiated emission limits are converted to 3m radiated emission limits by an inverse proportionality of 20 dB per decade. The normalized site attenuation of the semi-anechoic chamber is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on a 0.8m high wooden support above the reference ground plane. The turntable was rotated 360° around and the antenna was varied from 1m to 4m to find the maximum disturbance. The test was performed with the antenna both in its horizontal and vertical polarizations.

The following figures were those measured and recorded by a test receiver. The curves in the figure were those measured with a Peak detector. The symbol “◆” in the figures are those of QP value which were measured in final measurement. Quasi-peak measurements were only performed at those critical frequencies obtained during the test with Peak Detector.

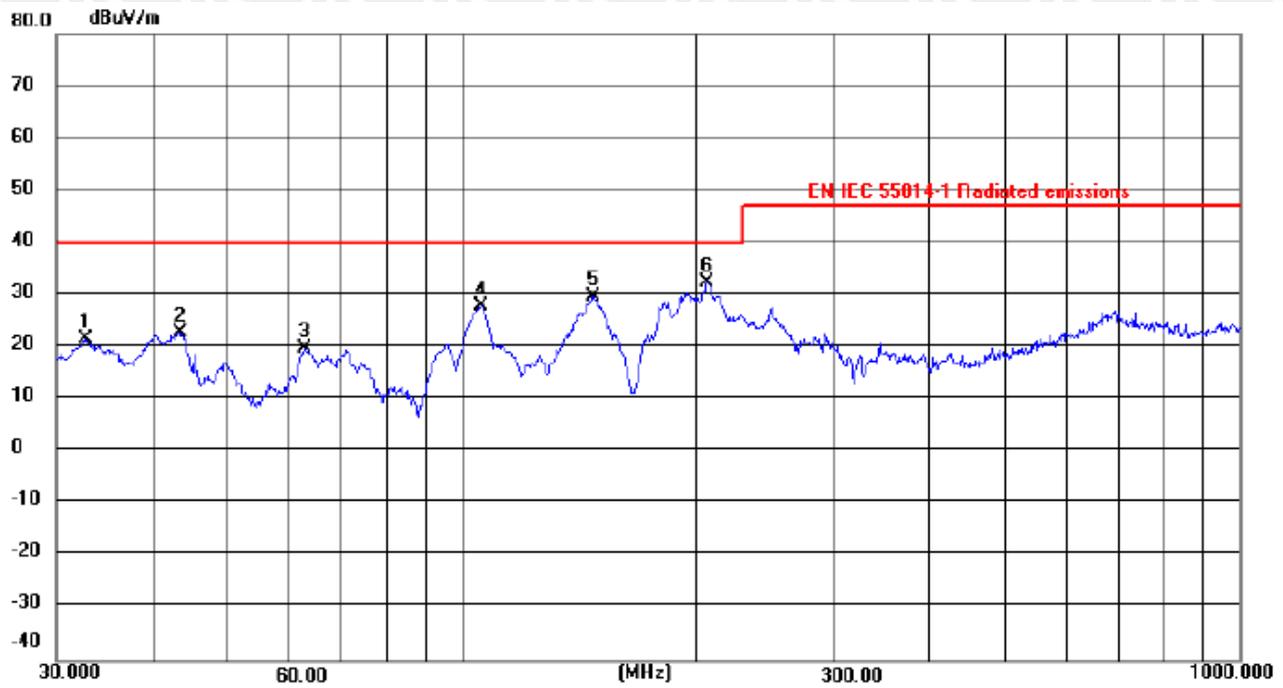
Remark: AC mode and DC mode were both tested, and most unfavorable test data of AC mode is recorded. And all the tests were carried out using AC/DC transformer for power supply.

Figure 3: Test Curve of Radiated Emission in the frequency range of 30-1000MHz, Horizontal (AC 120V)



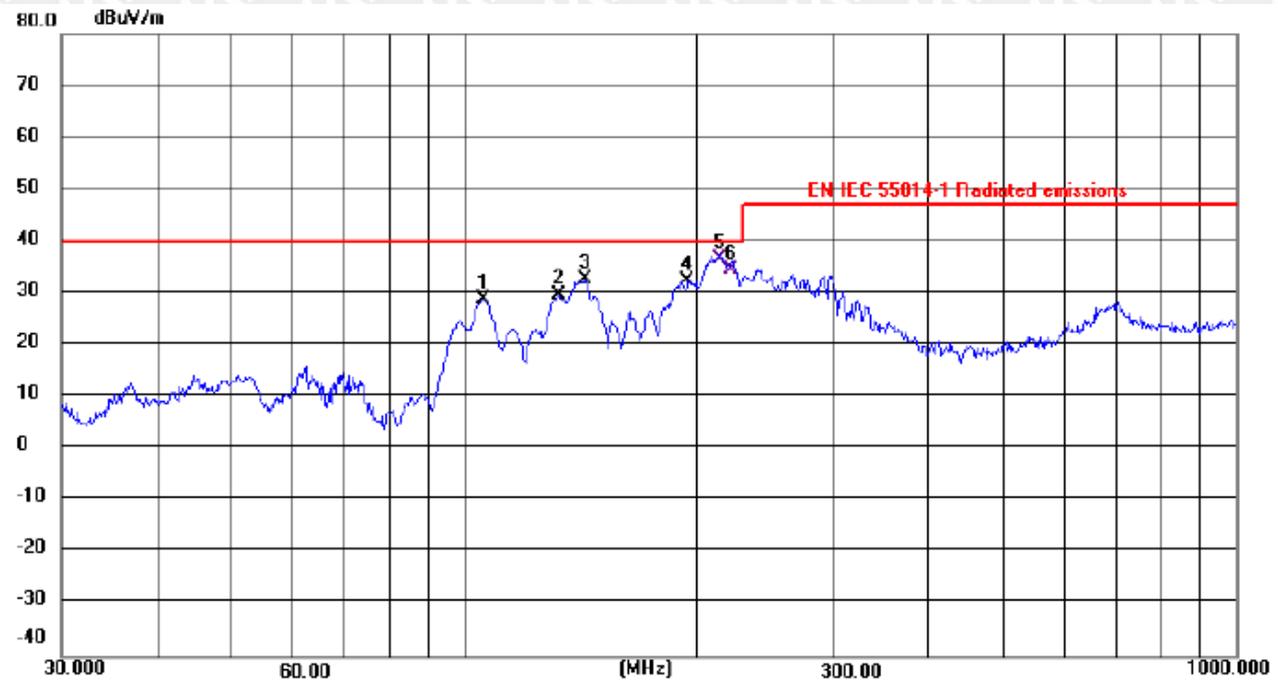
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F
1	104.1701	51.82	-23.81	28.01	40.00	-11.99	peak	200	103	P
2	147.4036	51.62	-19.34	32.28	40.00	-7.72	peak	200	337	P
3	181.2834	51.77	-19.81	31.96	40.00	-8.04	peak	200	260	P
4	195.8220	55.28	-21.23	34.05	40.00	-5.95	peak	200	42	P
5 *	213.7634	59.10	-20.47	38.63	40.00	-1.37	QP	100	85	P
6	295.1469	51.18	-16.33	34.85	47.00	-12.15	peak	100	207	P

Figure 4: Test Curve of Radiated Emission in the frequency range of 30-1000MHz, Vertical (AC 120V)



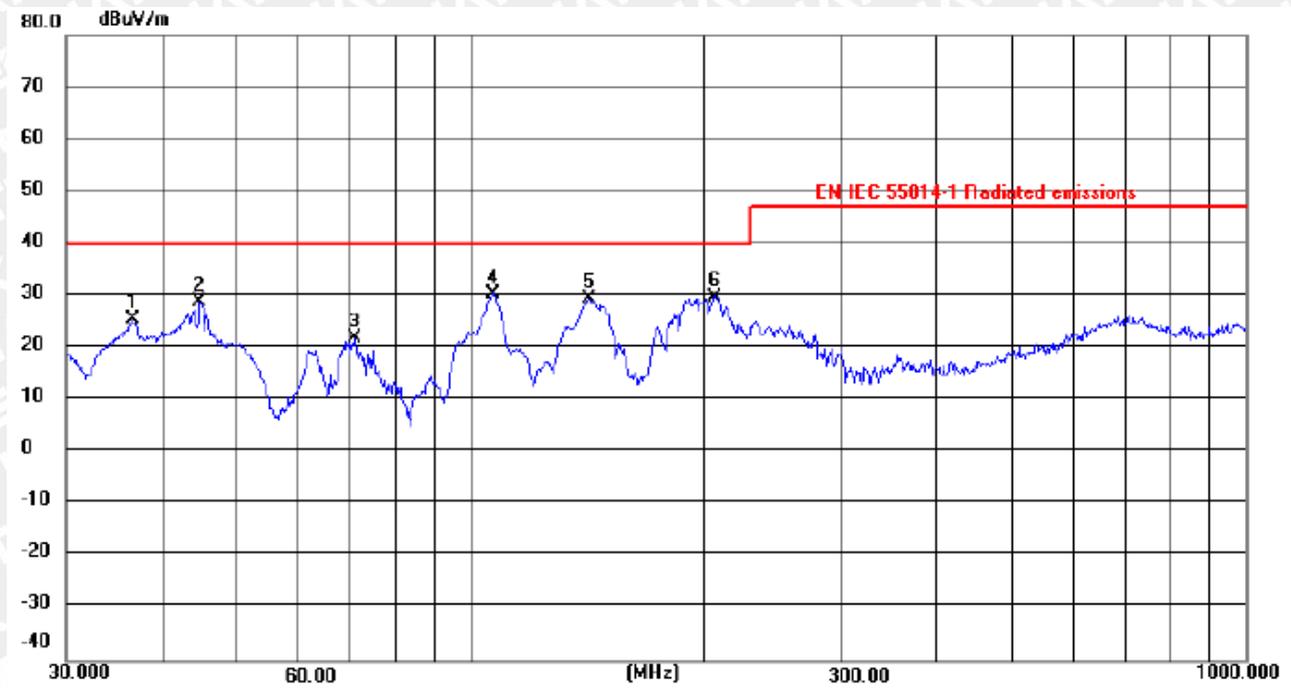
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F
1	32.6340	41.87	-20.18	21.69	40.00	-18.31	peak	100	16	P
2	43.2017	43.39	-20.47	22.92	40.00	-17.08	peak	100	181	P
3	62.6507	42.16	-22.32	19.84	40.00	-20.16	peak	100	121	P
4	105.6415	51.49	-23.64	27.85	40.00	-12.15	peak	100	138	P
5	147.4036	49.14	-19.34	29.80	40.00	-10.20	peak	100	312	P
6 *	206.3976	53.24	-20.93	32.31	40.00	-7.69	peak	100	303	P

Figure 5: Test Curve of Radiated Emission in the frequency range of 30-1000MHz, Horizontal (AC 230V)



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F
1	105.6415	52.57	-23.64	28.93	40.00	-11.07	peak	200	120	P
2	132.2205	50.50	-20.72	29.78	40.00	-10.22	peak	200	329	P
3	143.3260	52.17	-19.55	32.62	40.00	-7.38	peak	200	164	P
4	194.4534	53.58	-21.20	32.38	40.00	-7.62	peak	100	250	P
5 *	213.7634	57.00	-20.47	36.53	40.00	-3.47	QP	100	68	P
6	221.3921	54.60	-20.01	34.59	40.00	-5.41	QP	100	94	P

Figure 6: Test Curve of Radiated Emission in the frequency range of 30-1000MHz, Vertical (AC 230V)



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F
1	36.6375	45.88	-20.31	25.57	40.00	-14.43	peak	100	92	P
2	44.7433	49.38	-20.49	28.89	40.00	-11.11	peak	100	187	P
3	70.5836	45.43	-23.36	22.07	40.00	-17.93	peak	100	309	P
4 *	106.7587	53.93	-23.50	30.43	40.00	-9.57	peak	100	101	P
5	141.8262	48.95	-19.62	29.33	40.00	-10.67	peak	100	317	P
6	206.3976	50.83	-20.93	29.90	40.00	-10.10	peak	100	283	P

5 Test Results I M M U N I T Y

Performance criterion:

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.

Room temperature : 24-26 °C
Relative Humidity : 45-58%

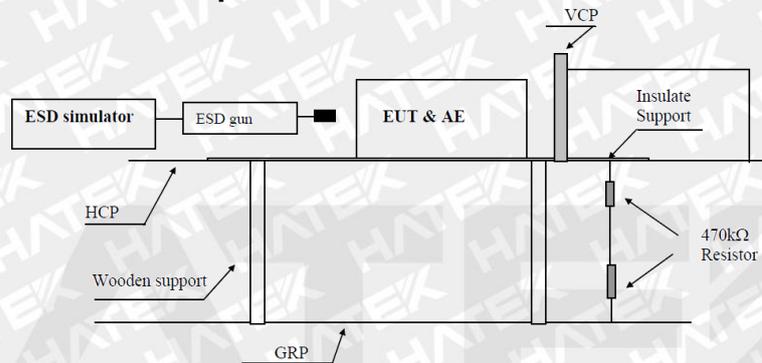
Conclusion: Pass

5.1 Enclosure

5.1.1 Electrostatic Discharge

- Charge voltage : $\pm 4.0\text{kV}$ (Conducted Discharge)
 $\pm 8.0\text{kV}$ (Air Discharge)
- Polarity : positive / negative
- Number of discharges : >10
- Performance criteria : B

Block Diagram of Test Set up



- For table top equipment, wooden support is 0.8m height.
- For floor standing equipment, wooden support is 0.1m height.

Test Procedure

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 0,8m 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.

Table 4: ESD, Positive / Negative Polarity

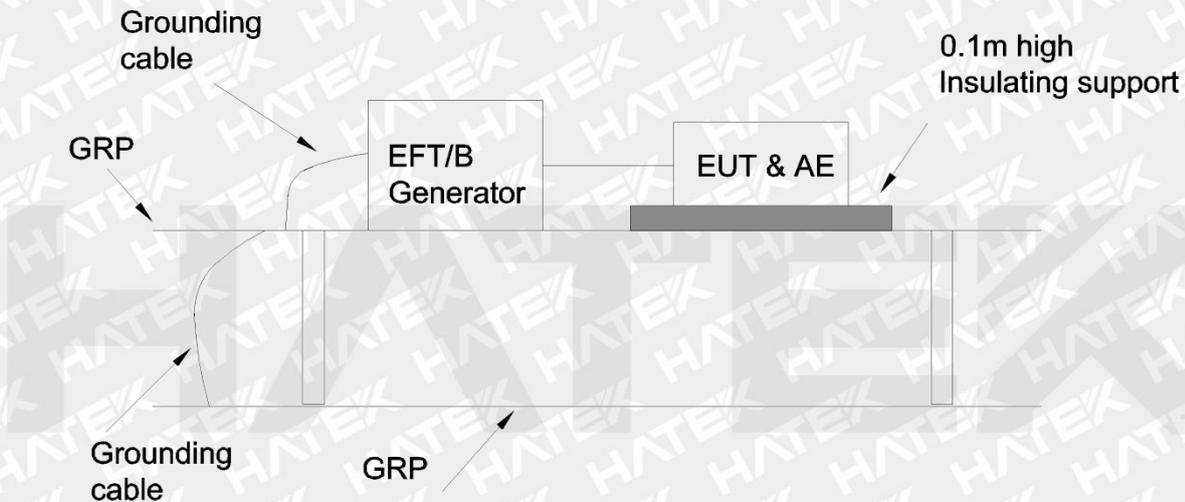
Position	Kind of Discharge	Remarks	Result
Accessible nonmetal Enclosure	Air discharge $\pm 8\text{kV}$	No change of function	Pass
Metal Enclosure	Contact discharge $\pm 4\text{kV}$	No change of function	Pass
Coupling plane (Both HCP and VCP)	Contact discharge $\pm 4\text{kV}$	No change of function	Pass

5.2 Input and Output AC Power Ports

5.2.1 Fast Transients on AC and DC Power Lines

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

Block Diagram of Test Set up



Test Procedure

The immunity against fast transients on AC and DC 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.

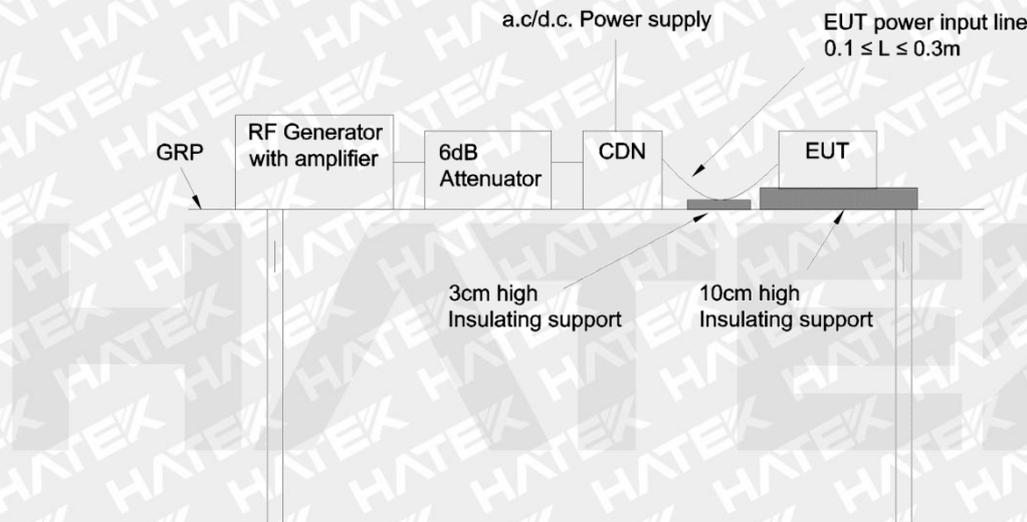
Table 5: Burst, AC Power lines, Positive and Negative Polarity

Line	Result	Remark
AC Input (L+N)	±1kV Pass	No disturbance of function

5.2.2 Injected Current into AC Power Port

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

Block Diagram of Test Set up



Test Procedure

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.

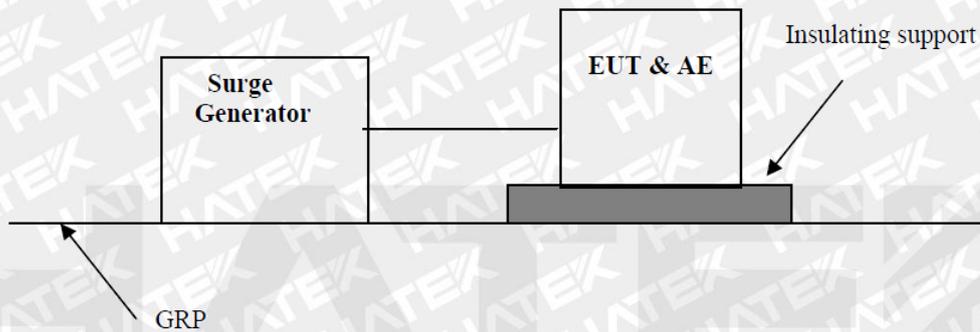
Table 6: Injected current, AC Power Port

Line	Coupling Method:	Remark	Result
AC Power Lines	CDN M-3	No disturbance of function	Pass

5.2.3 Surges to AC Power Port

Test Level : phase to neutral $\pm 1\text{kV}$
 : phase/neutral to PE $\pm 2\text{kV}$
 Tr/Tn : 1.2/50 μs (open-circuit voltage)
 : 8/20 μs (short-circuit current)
 Test numbers : 5 positive and 5 negative pulses
 Repetition rate : 1 surge/min
 Performance criteria : B

Block Diagram of Test Set up



Test Procedure

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. The EUT is placed on 0,1m wood table above the ground plane.

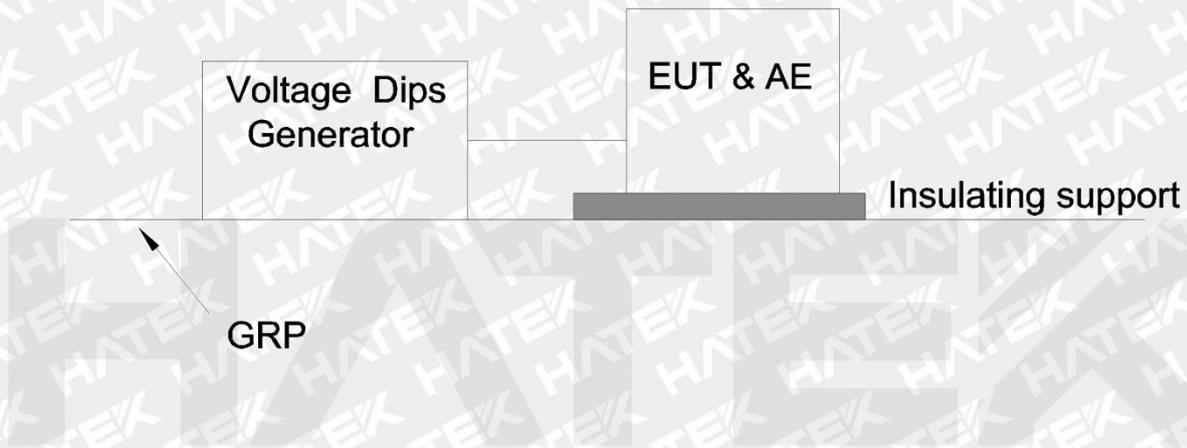
Table 7: Surges to AC Power lines, positive/negative

Line	Tested voltage/coupling phase	Test angle	Observation	Result
Phase to neutral	+1 kV, $+\pi/2$ (5 times) -1 kV, $-\pi/2$ (5 times)	90° 270°	No disturbance of function	Pass Pass

5.2.4 Voltage dips and interruptions to AC Power Port

Performance criteria	:	C	
Test level (in % UT) and	:	0	0.5/0.5 periods(50/60Hz)
duration (in periods of the	:	40	10/12 periods(50/60Hz)
rated frequency)	:	70	25/30 periods(50/60Hz)

Block Diagram of Test Set up



Test Procedure

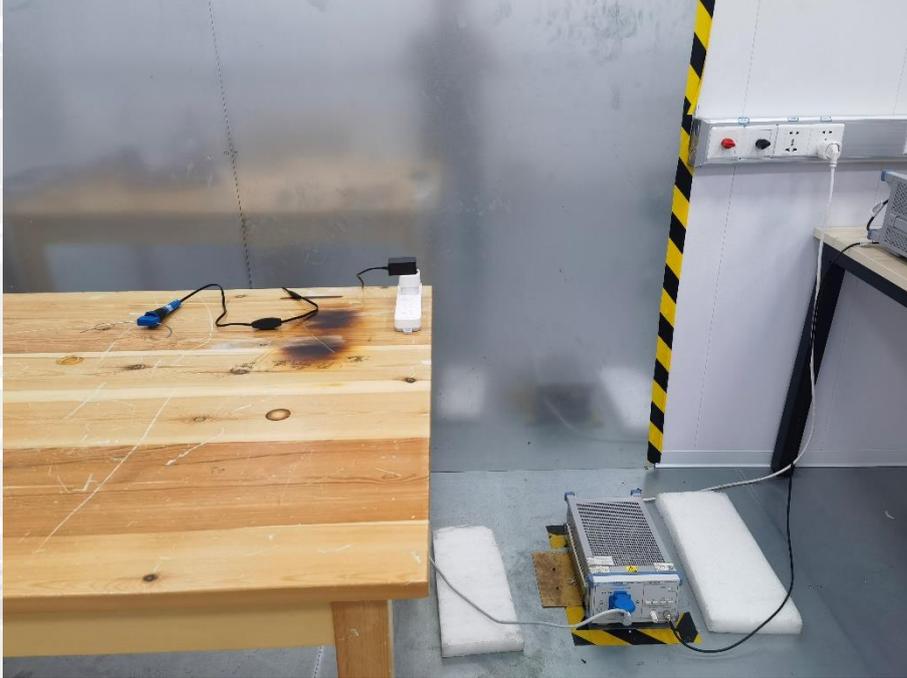
The immunity against voltage dips and interruptions to AC power port was tested in accordance to EN IEC 55014-2:2021. Test setup and the test generator are according to EN 61000-4-11 which is specified by EN IEC 55014-2:2021. The EUT was placed directly on the table of aluminum.

Table 8: Test condition and Test Result for Voltage dips and Short interruptions

Test level (in % UT)	Duration	Performance criteria	Remarks	Result
0	0,5 (10ms)	C	No disturbance of function	Pass
40	10 (200ms)	C	No disturbance of function	Pass
70	25 (0.5s)	C	No disturbance of function	Pass

6 Photographs of the EUT

Photograph 1: Set-up for Disturbance Voltage



Photograph 2: Set-up for Radiated Emission



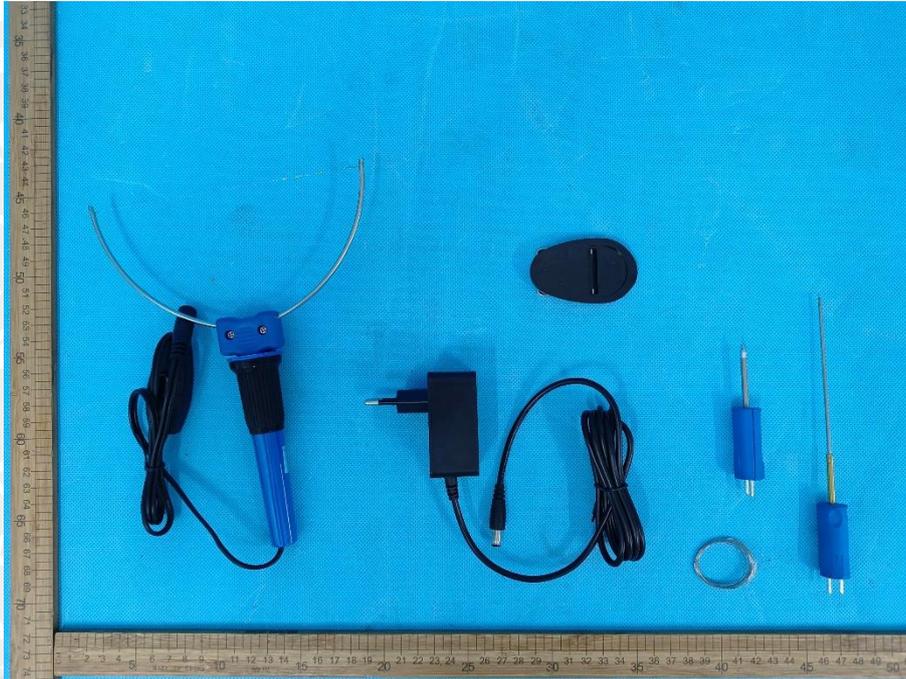
Photograph 3: Set-up for EFT, Surge and Voltage Dips



Photograph 4: Overall view of EUT (ZD-20K)



Photograph 5: Overall view of EUT (ZD-20K)



Photograph 6: Overall view of EUT (ZD-20K)



Photograph 7: Overall view of EUT (ZD-20K)



Photograph 8: Internal view of EUT (ZD-20K)



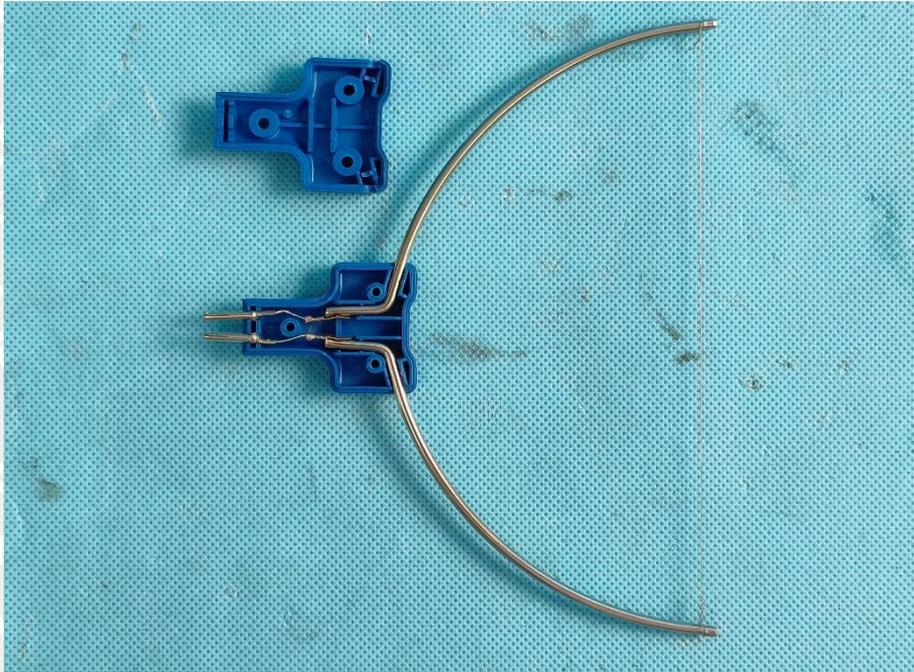
Photograph 9: Internal view of EUT (ZD-20K)



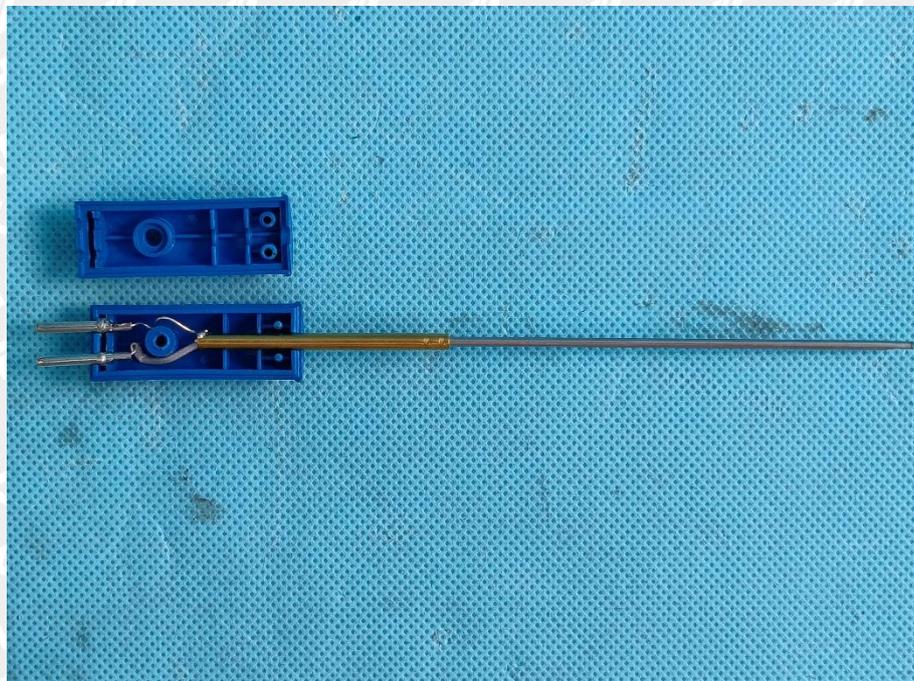
Photograph 10: Internal view of EUT (ZD-20K)



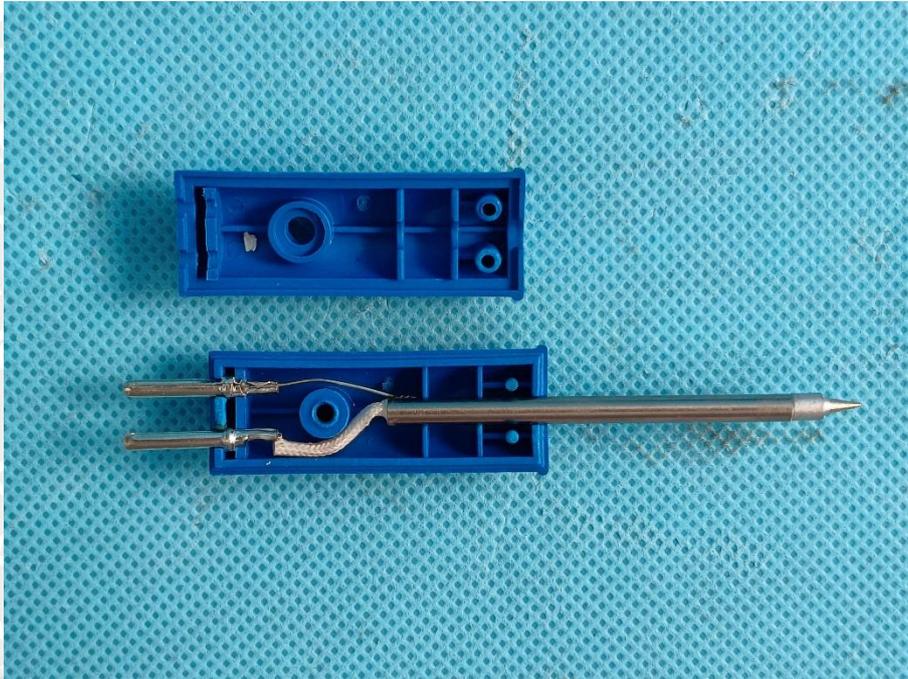
Photograph 11: Internal view of EUT (ZD-20K)



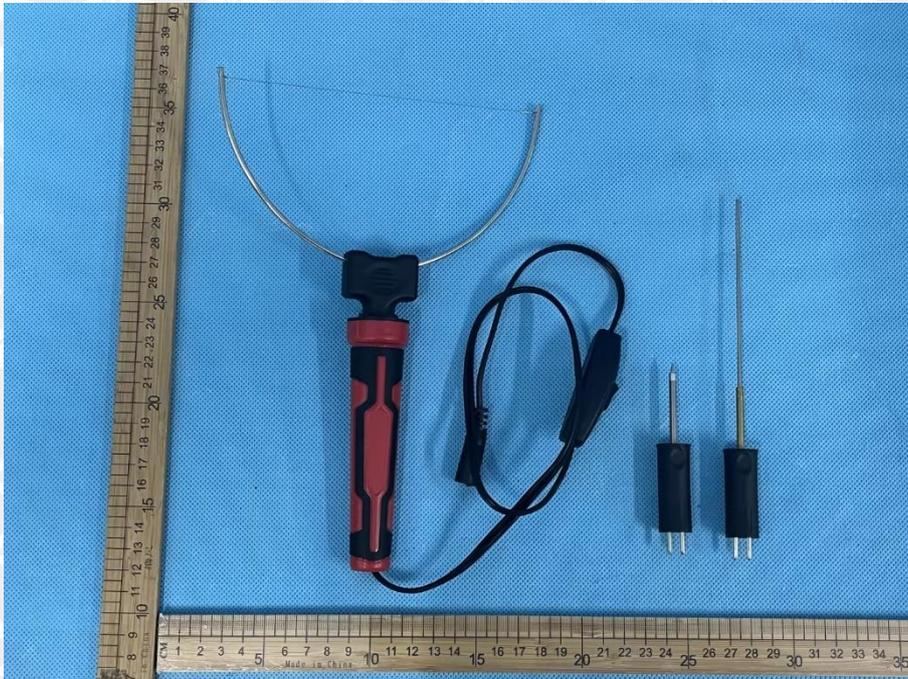
Photograph 12: Internal view of EUT (ZD-20K)



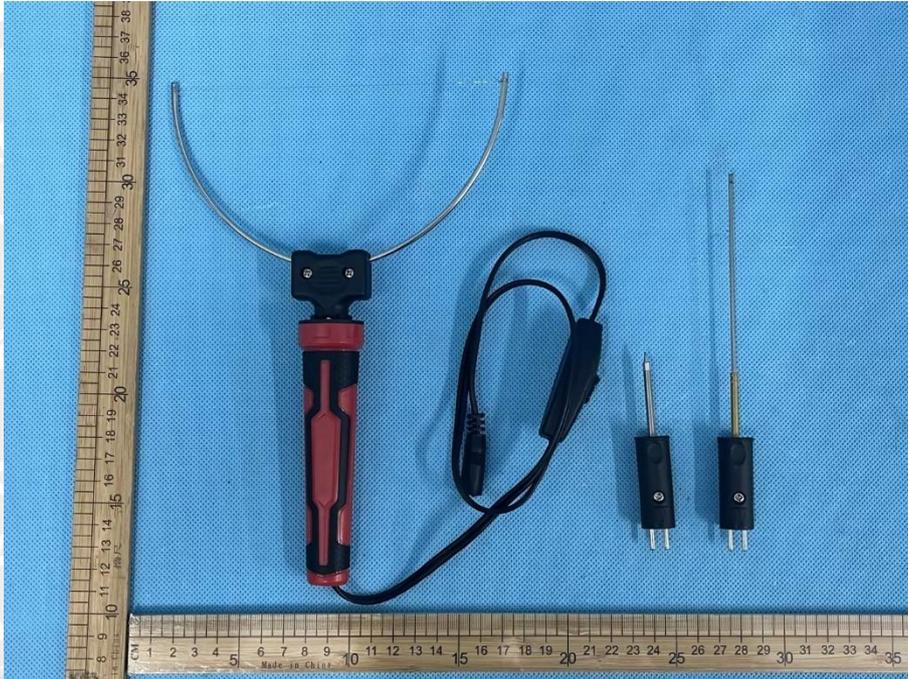
Photograph 13: Internal view of EUT (ZD-20K)



Photograph 14: Overall view of EUT (ZD-20K-1)



Photograph 15: Overall view of EUT (ZD-20K-1)



7 List of Tables

Table 1: List of Test and Measurement Equipment of Laboratory	5
Table 2: Voltage fluctuations and flicker measurement results	8
Table 3: Click Test Results of RUN A.....	14
Table 4: ESD, Positive / Negative Polarity	22
Table 5: Burst, AC Power lines, Positive and Negative Polarity.....	23
Table 6: Injected current, AC Power Port.....	24
Table 7: Surges to AC Power lines, positive/negative.....	25
Table 8: Test condition and Test Result for Voltage dips and Short interruptions	26

8 List of Figures

Figure 1: Test Curve of Conducted Emission in the frequency range of 150kHz - 30MHz, L line	11
Figure 2: Test Curve of Conducted Emission in the frequency range of 150kHz - 30MHz, N line	12
Figure 3: Test Curve of Radiated Emission in the frequency range of 30-1000MHz, Horizontal (AC 120V)	17
Figure 4: Test Curve of Radiated Emission in the frequency range of 30-1000MHz, Vertical (AC 120V)	18
Figure 5: Test Curve of Radiated Emission in the frequency range of 30-1000MHz, Horizontal (AC 230V)	19
Figure 6: Test Curve of Radiated Emission in the frequency range of 30-1000MHz, Vertical (AC 230V)	20

9 List of Photographs

Photograph 1: Set-up for Disturbance Voltage	27
Photograph 2: Set-up for Radiated Emission	27
Photograph 3: Set-up for EFT, Surge and Voltage Dips	28
Photograph 4: Overall view of EUT (ZD-20K)	28
Photograph 5: Overall view of EUT (ZD-20K)	29
Photograph 6: Overall view of EUT (ZD-20K)	29
Photograph 7: Overall view of EUT (ZD-20K)	30
Photograph 8: Internal view of EUT (ZD-20K)	30
Photograph 9: Internal view of EUT (ZD-20K)	31
Photograph 10: Internal view of EUT (ZD-20K)	31
Photograph 11: Internal view of EUT (ZD-20K)	32
Photograph 12: Internal view of EUT (ZD-20K)	32
Photograph 13: Internal view of EUT (ZD-20K)	33
Photograph 14: Overall view of EUT (ZD-20K-1)	33
Photograph 15: Overall view of EUT (ZD-20K-1)	34

----- End of Test Report -----