

Test Report

Report No. : HA0123NB125912EM
Applicant : Ningbo Zhongdi Industry & Trade Co., Ltd.
Address : Jishigang Industry Zone, Haishu District, Ningbo 315171, P. R. China
Trade Mark(s) : Zhongdi
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 : Magnifying Lamp
Model/Type No. : ZD-123 LED, ZD-122 LED, ZD-121 LED, ZD-137 LED
Standards : Refer to page 2
Date of Receipt : December 29, 2023
Date of Test : January 02, 2024 to February 02, 2024
Date of Issue : February 03, 2024
Test Result : **PASS***

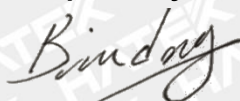
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Prepared By



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*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
Harmonics on AC Mains		P
Voltage changes, voltage fluctuations and flicker on AC mains		P
Mains Terminal Continuous Disturbance Voltage		P
Radiated Electromagnetic Disturbance		P
Radiated disturbance		P
Electrostatic Discharge (ESD)		P
Radio Frequency Electromagnetic Field		P
Power-frequency magnetic field		N/A
Fast Transients (EFT)		P
Injected Current		P
Surges		P
Voltage dips and interruptions to AC Power Port		P
Remark:	P: Pass/ F: Fail/ N/A: Not Applicable	

1.2 Test Specification

The equipment comply with the requirements according to the following standards:

EN IEC 55015:2019+A11:2020: Limit and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment.

EN IEC 61547:2023: Equipment for general lighting purpose-EMC immunity requirements.

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	Harmonics on AC Mains	7
4.1.2	Voltage changes, voltage fluctuations and flicker on AC mains	9
4.1.3	Mains Terminal Continuous Disturbance Voltage	10
4.1.4	Radiated Electromagnetic Disturbance	14
4.2	Emission in the Frequency Range above 30 MHz	19
4.2.1	Radiated disturbance	19
5	TEST RESULTS I M M U N I T Y	23
5.1	Enclosure	24
5.1.1	Electrostatic Discharge	24
5.1.2	Radio Frequency Electromagnetic Field	25
5.2	Input and Output Power Ports	26
5.2.1	Fast Transients / Burst	26
5.2.2	Injected Current into	27
5.2.3	Surges	28
5.2.4	Voltage dips and interruptions	29
6	PHOTOGRAPHS OF THE EUT AND TEST SET-UP	30
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

Ratings : AC 220-240V, 50Hz, 10W

2.3 Identifies and differences:

All models are the same, just different in appearance.

Therefore, we test ZD-123 LED and the worst test data is listed in the report as representative.

2.4 Environment

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

2.5 Submitted Documents

Circuit diagram, Construction Drawings,
BOM, User's Manual and Labels 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

Equipment	Manufacturer	Model	Serial No.	Due Date
Receiver	R&S	ESR3	102043	08/25/2024
LISN	R&S	ENV216	102058	08/25/2024
3-Loop Antenna	R&S	HM020	100984	07/03/2024
CDN	R&S	CDN M2/M3	051/044	07/02/2024
ESD Simulator	EM-TEST	ESD 30N	P1526159867	11/18/2024
3M Chamber & Accessory Equipment	TDK	SAC-3	----	---
Signal Generator	R&S	SMB100A	179680	08/25/2024
Stacked double Log.-Per. Antenna	R&S	HL046E	-----	N/A
Power Amplifier	R&S	BBA150-BC1000	102131	08/25/2024
Power Amplifier	BONN	1060-400/100D	1610682	N/A
Stacked Double Log-Per Antenna	SCHWARZBECK	STLP9149	9149435	N/A
Compact Generator	EM-TEST	UCS500N7	P1608172945	08/25/2024
coupling/decoupling network	EM-TEST	CNI503B7	P1626181212	08/25/2024
Motorized Variac	EM-TEST	MV2616	P1532162313	08/25/2024
Signal Generator	R&S	SMC100A	105636	08/25/2024
Power Amplifier	R&S	BBA150A200B250	102124	08/25/2024
Attenuator	Bird	300-A-FFN-06	1617	08/25/2024
CDN	FCC	FCC-801-M2/M3-16A	170209	08/25/2024
Harmonic & Flicker System	EM-TEST	DPA 503N& AIF 503N32.1	P1545166605 & P1613178045	08/25/2024
Multifunction AC/DC Power Source	EM-TEST	NetWave 30-400	P1613178144	08/25/2024

3.3 Measurement Uncertainty

Conducted Emission (9-150KHz) : U = 3.6 dB

Radiated Emission (30-1000MHz) : U = 4.5 dB

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	:	20-25°C
Relative Humidity	:	45-50 %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 Setup



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 was conducted with an automatic current harmonic analyzing system.

This equipment is in compliance with the requirements of EN IEC 61000-3-2:2019+A1:2021.

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 C;

Test Result: Pass Source qualification: Normal
 THC(A): 0.010 I-THD(%): 19.0 POHC(A): 0.001 POHC Limit(A): 0.005

Highest parameter values during test:

V RMS (Volts): 230.13 Frequency(Hz):
 I Peak (Amps): 0.120 I RMS (Amps): 0.056
 I Fund (Amps): 0.054 Crest Factor: 2.150
 Power (Watts): 10.6 Power Factor: 0.822

Harm#	Harms(avg)	100%Limit	%of Limit	Harms(max)	150%Limit	%of Limit	Status
2	0.001	0.000	N/A	0.001	0.000	N/A	Pass
3	0.007	0.036	20.4	0.008	0.054	15.3	Pass
4	0.001	0.000	N/A	0.001	0.000	N/A	Pass
5	0.006	0.020	29.1	0.006	0.030	20.3	Pass
6	0.000	0.000	N/A	0.000	0.000	N/A	Pass
7	0.003	0.011	N/A	0.003	0.016	N/A	Pass
8	0.000	0.000	N/A	0.000	0.000	N/A	Pass
9	0.001	0.005	N/A	0.001	0.008	N/A	Pass
10	0.000	0.000	N/A	0.000	0.000	N/A	Pass
11	0.001	0.004	N/A	0.001	0.006	N/A	Pass
12	0.000	0.000	N/A	0.000	0.000	N/A	Pass
13	0.001	0.003	N/A	0.001	0.005	N/A	Pass
14	0.000	0.000	N/A	0.000	0.000	N/A	Pass
15	0.001	0.003	N/A	0.001	0.004	N/A	Pass
16	0.000	0.000	N/A	0.000	0.000	N/A	Pass
17	0.000	0.002	N/A	0.001	0.004	N/A	Pass
18	0.000	0.000	N/A	0.000	0.000	N/A	Pass
19	0.000	0.002	N/A	0.000	0.003	N/A	Pass
20	0.000	0.000	N/A	0.000	0.000	N/A	Pass
21	0.001	0.002	N/A	0.001	0.003	N/A	Pass
22	0.000	0.000	N/A	0.000	0.000	N/A	Pass
23	0.001	0.002	N/A	0.001	0.003	N/A	Pass
24	0.000	0.000	N/A	0.000	0.000	N/A	Pass
25	0.000	0.002	N/A	0.001	0.002	N/A	Pass
26	0.000	0.000	N/A	0.000	0.000	N/A	Pass
27	0.001	0.002	N/A	0.001	0.002	N/A	Pass
28	0.001	0.000	N/A	0.001	0.000	N/A	Pass
29	0.001	0.001	N/A	0.001	0.002	N/A	Pass
30	0.000	0.000	N/A	0.000	0.000	N/A	Pass
31	0.000	0.001	N/A	0.001	0.002	N/A	Pass
32	0.001	0.000	N/A	0.001	0.000	N/A	Pass
33	0.000	0.001	N/A	0.000	0.002	N/A	Pass
34	0.000	0.000	N/A	0.000	0.000	N/A	Pass
35	0.000	0.001	N/A	0.000	0.002	N/A	Pass
36	0.000	0.000	N/A	0.000	0.000	N/A	Pass
37	0.000	0.001	N/A	0.000	0.002	N/A	Pass
38	0.000	0.000	N/A	0.000	0.000	N/A	Pass
39	0.000	0.001	N/A	0.000	0.002	N/A	Pass
40	0.000	0.000	N/A	0.000	0.000	N/A	Pass

Note: Dynamic limits were applied for this test (Class C < 25 Watts).

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
Limit : EN 61000-3-3:2013+A1:2019+A2:2021, Clause 5
Temperature : 25°C
Relative Humidity : 51 %RH
Test result : Pass

Block Diagram of Test Set up



Test Procedure

According to 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 $d(t)$ during a voltage change shall not exceed 3.3% for more than 500ms;
- _ the relative steady-state voltage change, dc , shall not exceed 3.3%;
- _ the maximum relative voltage change d_{max} , shall not exceed 4%
- _ the value of P_{st} shall not be greater than 1.0;

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

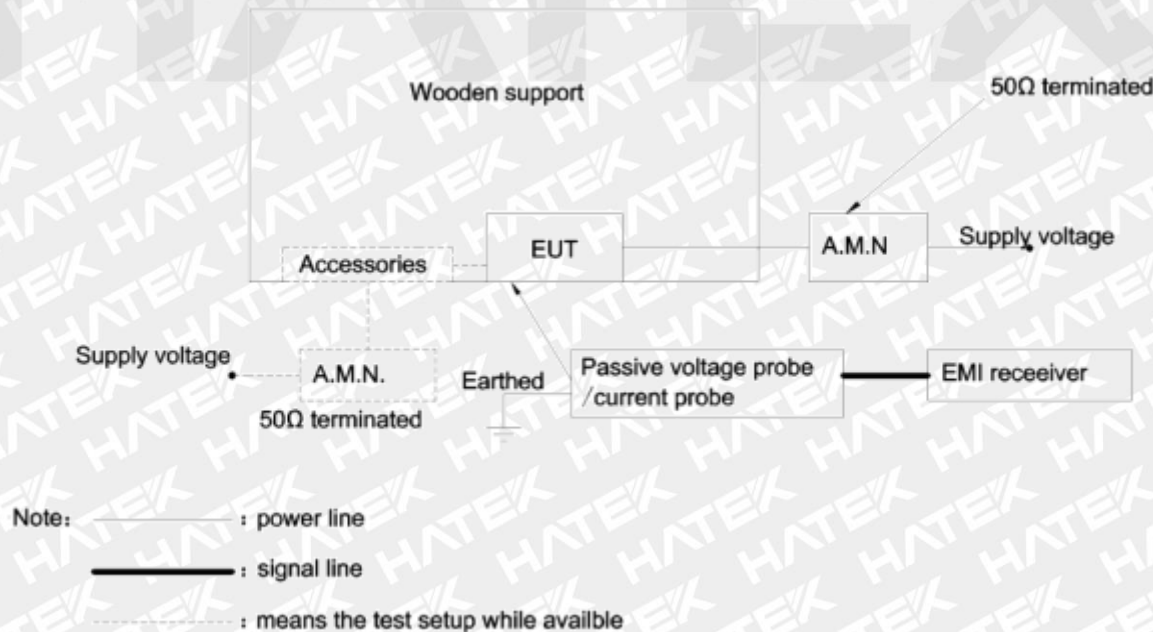
According to the low power of the sample, it will not produce voltage fluctuation and flick, which might exceed the related limits.

4.1.3 Mains Terminal Continuous Disturbance Voltage

General test information

Basic Standard	: EN IEC 55015:2019+A11:2020
Frequency range	: 9 kHz-30MHz
Kind of test site	: EMC Chamber
Temperature	: 20-25°C
Relative Humidity	: 45-50 %RH
Input Voltage	: AC 230V, 50Hz
Operational condition	: ON
Conical metal housing	: No
Earthing	: No
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 55015:2019+A11:2020 in a Shielding Room.

The measurement equipment like test receivers, quasi-peak detector and Artificial Mains Network (AMN) are in compliance with CISPR 16-1 series standards and EN IEC 55015:2019+A11:2020. 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 and after each measurement.

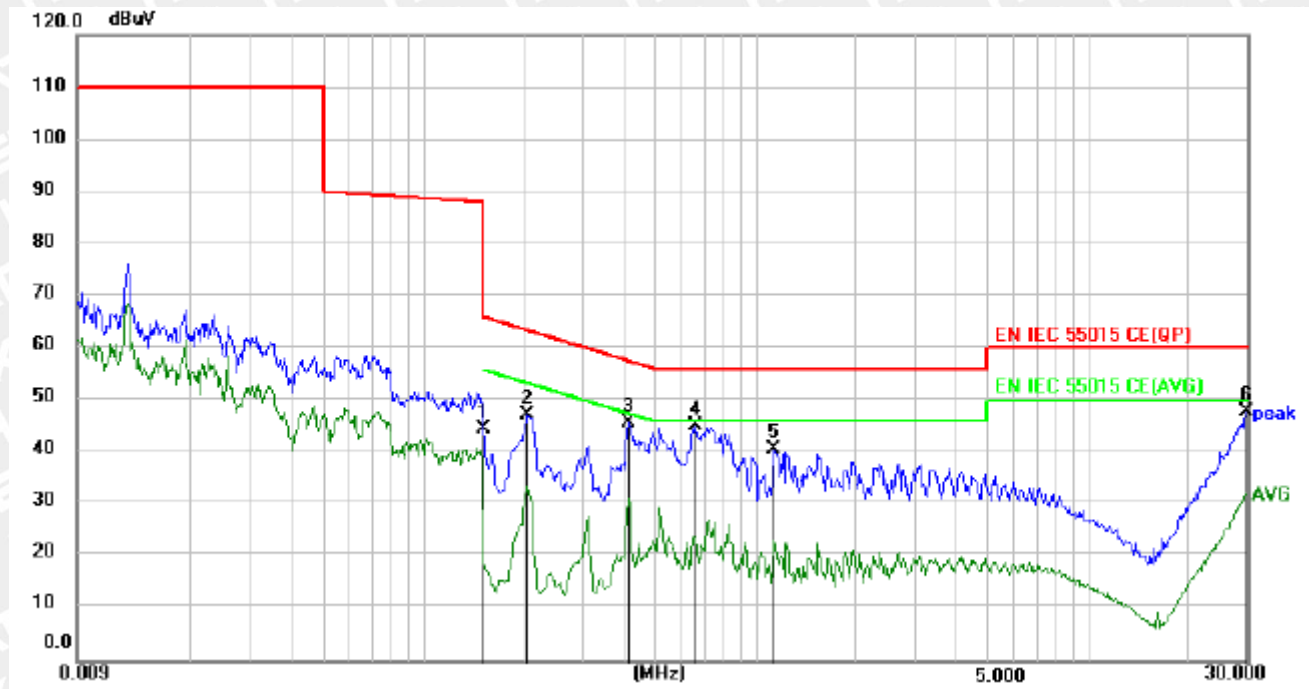
The EUT was operated for at least 15min before test.

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

The Disturbance Voltage was determined according to clause 8 of EN IEC 55015:2019+A11:2020 while measuring the line and neutral conductor by turns.

In following figures were those measured by an automatic measuring system. The disturbance voltage was scanned firstly with both 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 “♦” in blue color refers to Quasi-peak value and the symbol “◆” in green color refers Average values which were measured in the final measurement.

Figure 1: Spectral Diagrams, Conducted Emission, 0.009-30MHz, L



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1500	34.97	9.52	44.49	66.00	-21.51	peak	P
2	0.2040	37.76	9.52	47.28	63.45	-16.17	peak	P
3	0.4110	36.14	9.54	45.68	57.63	-11.95	peak	P
4 *	0.6585	35.55	9.56	45.11	56.00	-10.89	peak	P
5	1.1310	31.10	9.56	40.66	56.00	-15.34	peak	P
6	29.9805	37.99	9.91	47.90	60.00	-12.10	peak	P

Figure 2: Spectral Diagrams, Conducted Emission, 0.009-30MHz, N



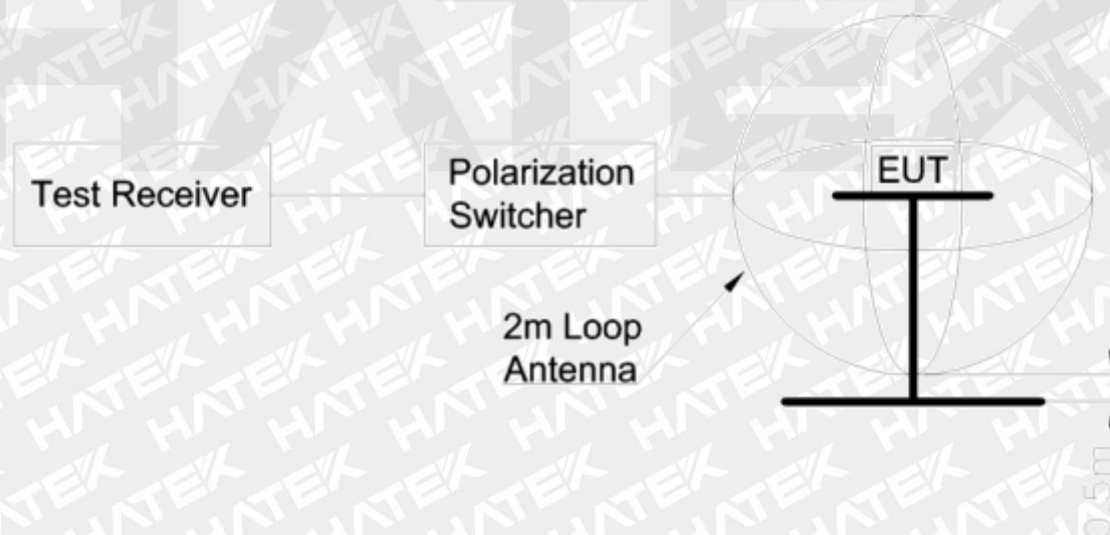
No.	Frequency (MHz)	Reading (dBuV)	Factor (dB)	Level (dBuV)	Limit (dBuV)	Margin (dB)	Detector	P/F
1	0.1500	41.16	9.49	50.65	66.00	-15.35	peak	P
2	0.2040	37.72	9.51	47.23	63.45	-16.22	peak	P
3	0.3075	32.86	9.52	42.38	60.04	-17.66	peak	P
4 *	0.5144	35.21	9.54	44.75	56.00	-11.25	peak	P
5	0.9240	32.35	9.56	41.91	56.00	-14.09	peak	P
6	1.2300	31.31	9.56	40.87	56.00	-15.13	peak	P

4.1.4 Radiated Electromagnetic Disturbance

General test information

Basic Standard	:	EN IEC 55015:2019+A11:2020
Port	:	Enclosure
Frequency range	:	9 kHz-30MHz
Kind of test site	:	EMC Chamber
Temperature	:	20-25°C
Relative Humidity	:	45-50 %RH
Input Voltage	:	230V
Operational condition	:	ON
Test result	:	Pass

Block Diagram of Test Set up



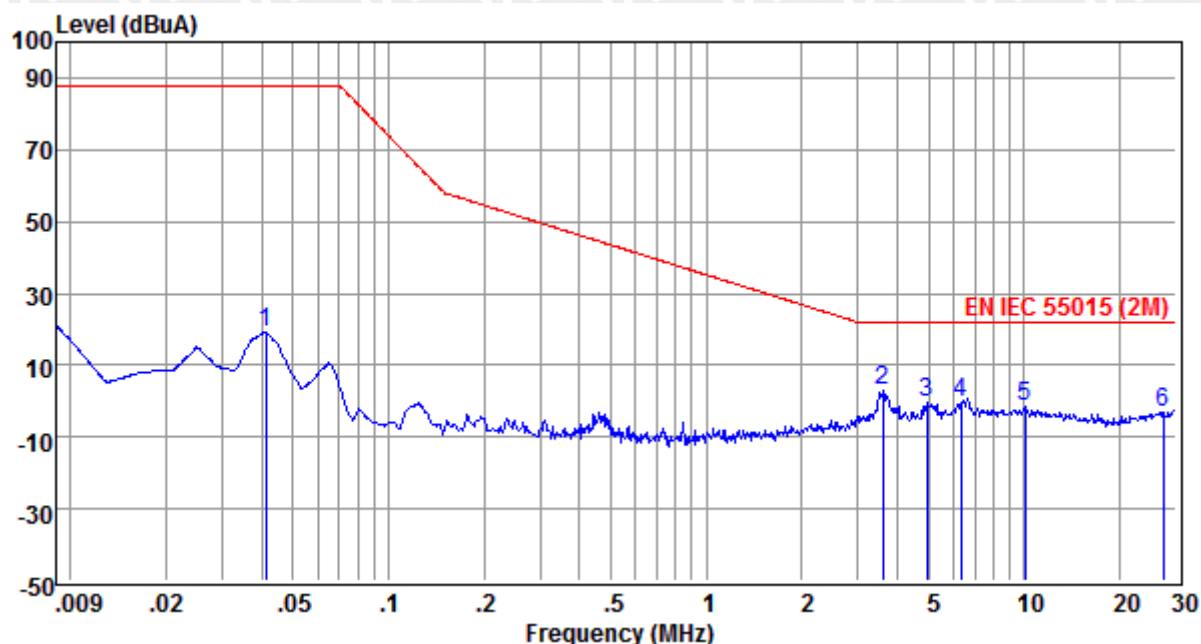
Test Procedure

The measurement equipment like test received, loop antenna and coaxial switch are in compliance with the CISPR 16-1 series standards. The test setup was made according to Clause 9 of EN IEC 55015:2019+A11:2020.

The EUT operated in ON mode and at its rated voltage. The EUT is put on a wooden table in the center of the loop antenna. Before a measurement the EUT was operated for about 20 min.

Induced current in the loop antenna was measured by means of a current probe (1V/A) according to clause 9 of EN IEC 55015:2019+A11:2020. The three field components were measured in sequence by means of a coaxial switch (loop antenna controller). The current in the three large loop antennas, originating from the three mutually orthogonal magnetic field components, were measured in sequences. Each value was fulfill the requirements given. The following figures were those measured.

Figure 3: Graphic description of radiated electromagnetic disturbances, X direction

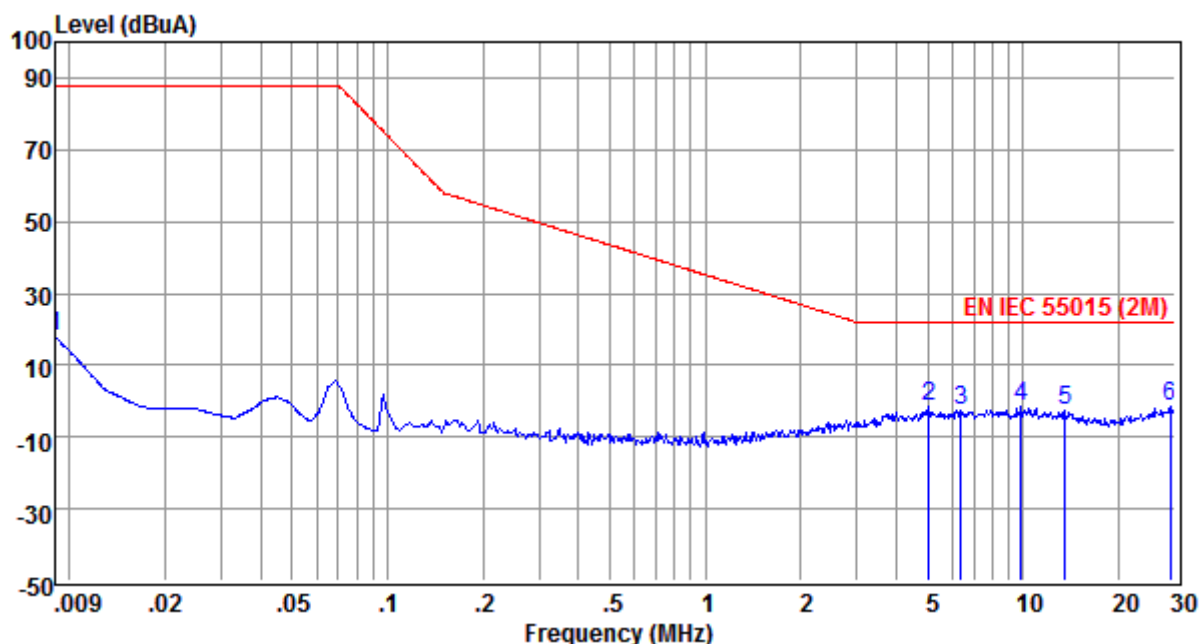


Pol: X

	Freq	Reading	LisnFac	CabLos	Measured	Limit	Over	Remark
	MHz	dBpW	dB	dB	dBpW	dBpW	dB	
1	0.04	20.51	0.00	-1.19	19.32	88.00	-68.68	Peak
2	3.58	0.49	0.00	2.51	3.00	22.00	-19.00	Peak
3	4.95	-2.11	0.00	1.98	-0.13	22.00	-22.13	Peak
4	6.32	-1.74	0.00	1.62	-0.12	22.00	-22.12	Peak
5	10.04	-2.56	0.00	0.83	-1.73	22.00	-23.73	Peak
6	27.44	-3.04	0.00	0.13	-2.91	22.00	-24.91	Peak

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss.
2. The emission levels that are 20dB below the official limit are not reported.

Figure 4: Graphic description of radiated electromagnetic disturbances, Y direction



Pol:

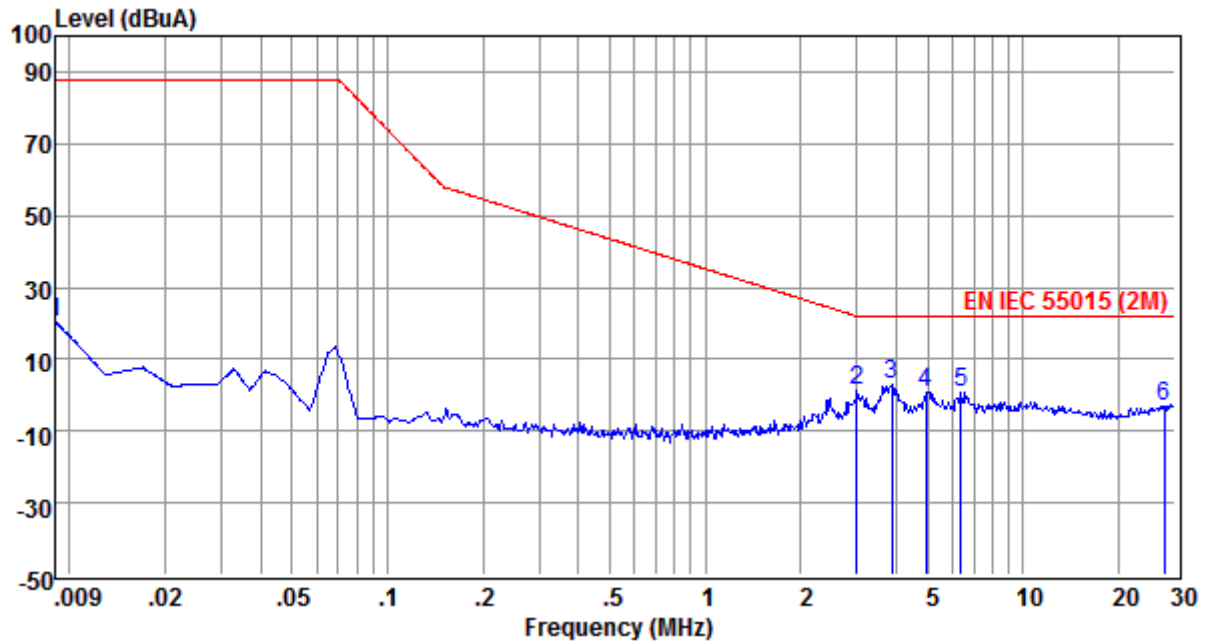
Y

	Freq	Reading	LisnFac	CabLos	Measured	Limit	Over	Remark
	MHz	dBpW	dB	dB	dBpW	dBpW	dB	
1	0.01	19.96	0.00	-2.10	17.86	88.00	-70.14	Peak
2	5.04	-1.88	0.00	0.16	-1.72	22.00	-23.72	Peak
3	6.37	-2.11	0.00	-0.27	-2.38	22.00	-24.38	Peak
4	9.87	-1.90	0.00	0.58	-1.32	22.00	-23.32	Peak
5	13.55	-4.74	0.00	2.22	-2.52	22.00	-24.52	Peak
6	29.04	0.10	0.00	-1.45	-1.35	22.00	-23.35	Peak

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss.

2. The emission levels that are 20dB below the official limit are not reported.

Figure 5: Graphic description of radiated electromagnetic disturbances, Z direction



Pol: Z

	Freq	Reading	LisnFac	CabLos	Measured	Limit	Over	Remark
	MHz	dBpW	dB	dB	dBpW	dBpW	dB	
1	0.01	23.36	0.00	-2.90	20.46	88.00	-67.54	Peak
2	3.00	1.71	0.00	-0.22	1.49	22.01	-20.52	Peak
3	3.85	3.42	0.00	-0.55	2.87	22.00	-19.13	Peak
4	4.95	1.98	0.00	-1.02	0.96	22.00	-21.04	Peak
5	6.37	2.18	0.00	-1.38	0.80	22.00	-21.20	Peak
6	27.89	-1.16	0.00	-1.84	-3.00	22.00	-25.00	Peak

Remarks: 1. Measured = Reading + Lisn Factor +Cable Loss.
2. The emission levels that are 20dB below the official limit are not reported.

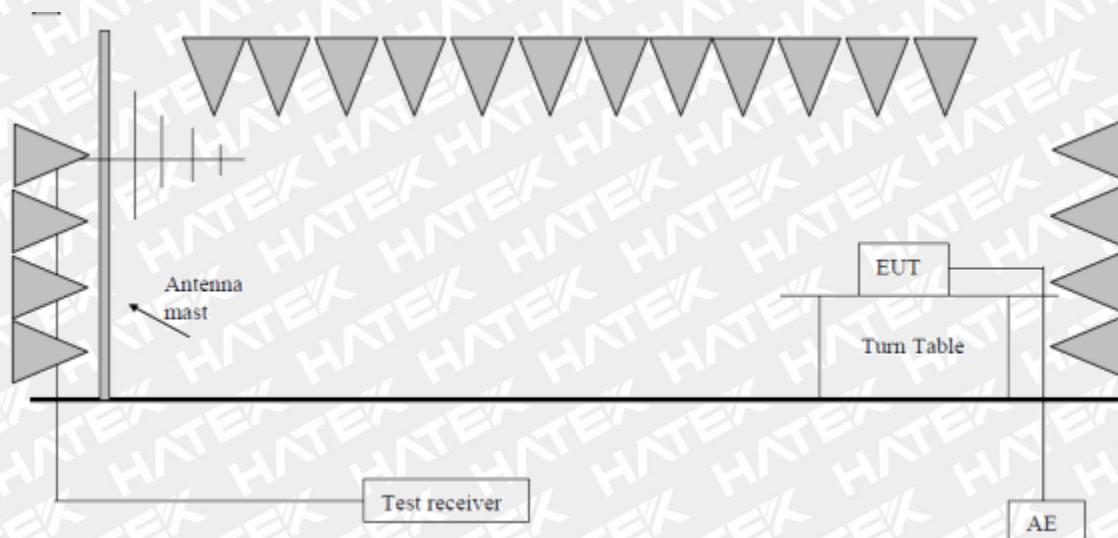
4.2 Emission in the Frequency Range above 30 MHz

4.2.1 Radiated disturbance

General test information

Frequency Range	: 30 - 1000MHz
Kind of test site	: Semi-anechoic Chamber
Port	: Enclosure
Measurement Distance	: 3 m
Polarization of Antenna	: Both horizontal and vertical
Temperature	: 20-25°C
Relative Humidity	: 45-50 %RH
Input Voltage	: 230V
Operational condition	: ON
Limit	: EN IEC 55015:2019+A11:2020, clause 4 table 3b
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 radiated disturbance was measured in the frequency range from 30MHz to 300MHz according to EN IEC 55015:2019+A11:2020. The measurement was performed in accordance with the method specified in Clause10 of CISPR 22.

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 “x” 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.

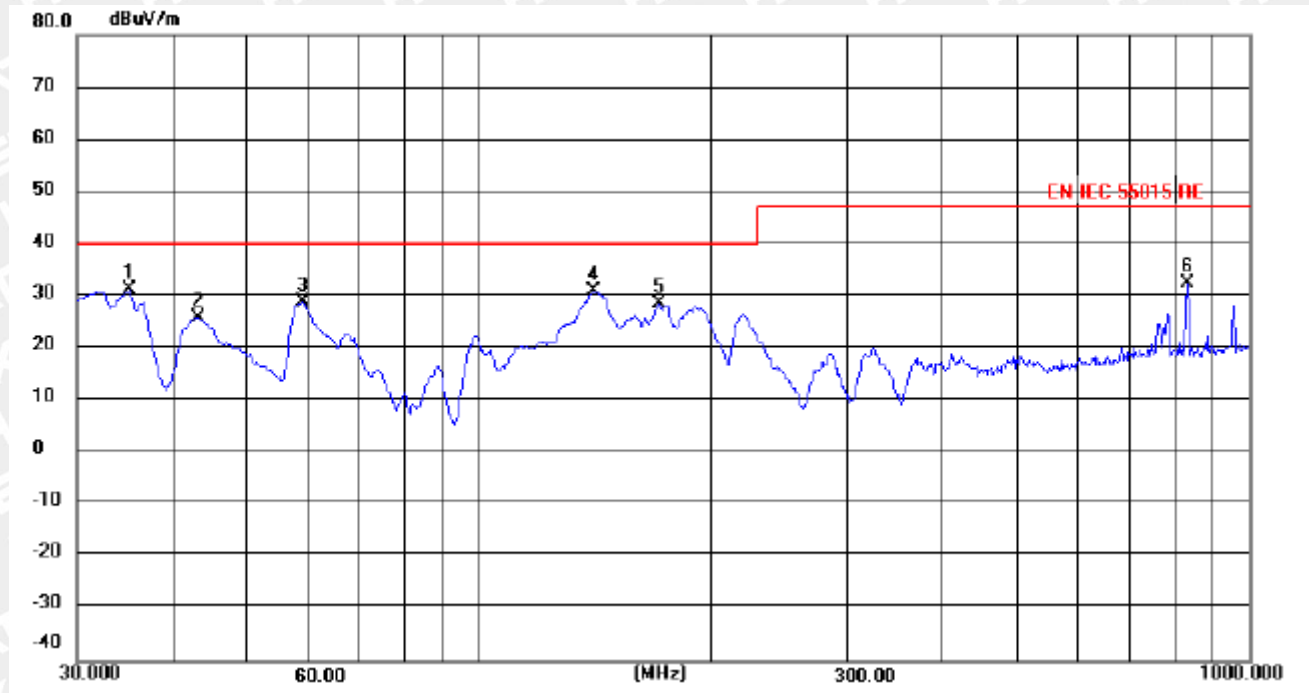
Remark: AC mode and DC mode were both tested, and most unfavorable test data of AC mode is recorded. And all the tests were carried out using AC/DC transformer for power supply.

Figure 6: Spectral Diagrams, Radiated Emission, 30MHz-1000MHz, Horizontal



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F
1	57.3923	34.30	-21.60	12.70	40.00	-27.30	peak	100	40	P
2	97.7983	41.24	-24.43	16.81	40.00	-23.19	peak	200	96	P
3	136.4598	39.58	-20.16	19.42	40.00	-20.58	peak	200	96	P
4 *	189.0743	51.52	-20.97	30.55	40.00	-9.45	peak	100	273	P
5	215.2678	46.23	-20.38	25.85	40.00	-14.15	peak	100	282	P
6	280.0237	35.57	-16.98	18.59	47.00	-28.41	peak	100	282	P

Figure 7: Spectral Diagrams, Radiated Emission, 30MHz-1000MHz, Vertical



No.	Frequency (MHz)	Reading (dBuV)	Factor (dB/m)	Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Detector	Height (cm)	Azimuth (deg.)	P/F
1 *	35.0048	51.45	-20.25	31.20	40.00	-8.80	peak	100	120	P
2	43.0505	46.39	-20.46	25.93	40.00	-14.07	peak	100	282	P
3	59.0251	50.67	-21.81	28.86	40.00	-11.14	peak	100	337	P
4	140.3421	50.79	-19.70	31.09	40.00	-8.91	peak	100	3	P
5	170.7926	47.54	-18.88	28.66	40.00	-11.34	peak	100	309	P
6	830.4002	37.07	-4.58	32.49	47.00	-14.51	peak	100	291	P

5 Test Results I M M U N I T Y

Performance criterion:

The performance criteria are based on the general criteria of the standard and derived from the product specification

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 : 20-25°C
Relative Humidity : 45-50 %RH

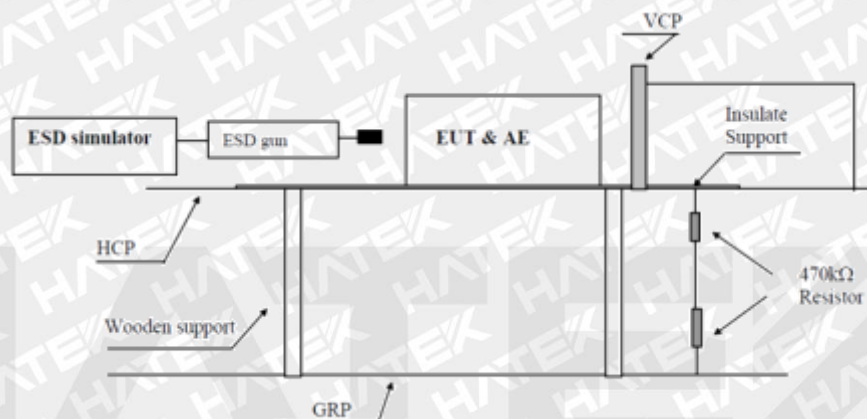
Conclusion: Pass

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



Test Procedure

The immunity against electrostatic discharge was tested in accordance with EN IEC 61547:2023. Test setup and ESD-Generator are according to EN 61000-4-2 which is specified by EN IEC 61547:2023.

The EUT is placed on 0.8 m 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.

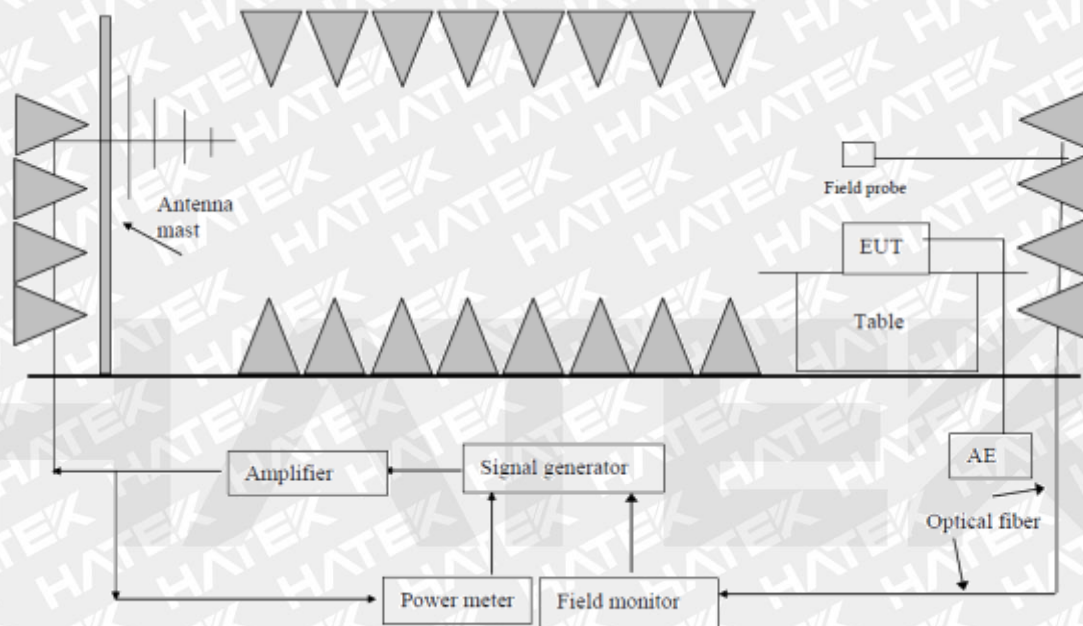
Table 3: ESD, Positive / Negative Polarity

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

5.1.2 Radio Frequency Electromagnetic Field

Test Level	:	3V/m
Frequency Range	:	80-1000MHz
Modulation	:	80%AM, 1kHz
Frequency Sweep Speed	:	≤ 0.005 octave/s ($1.5 \times 1E-3$ decades/s)
Performance Criteria	:	A

Block Diagram of Test Set up



Test Procedure

The immunity against radio-frequency electromagnetic fields in the frequency range between 80MHz and 1000MHz was tested in accordance to IEC 61000-4-3 which is specified by clause 4.2.3.1 in EN IEC 61547:2023.

The test was performed inside a 3m modified semi-anechoic chamber. During the test the part of the ground plane between the field generating antenna and the equipment under test was covered by absorbing material. The distance between the tip of the antenna and the side of the system tested is 3m. The field uniformity of the 1.5mx1.5m plane where the surface of the EUT tested coincides with is regularly calibrated to ensure the 0-6dB field uniformity criterion as specified by IEC 61000-4-3 is met.

Table 4: Radiated Susceptibility, Field Strength 3V/m

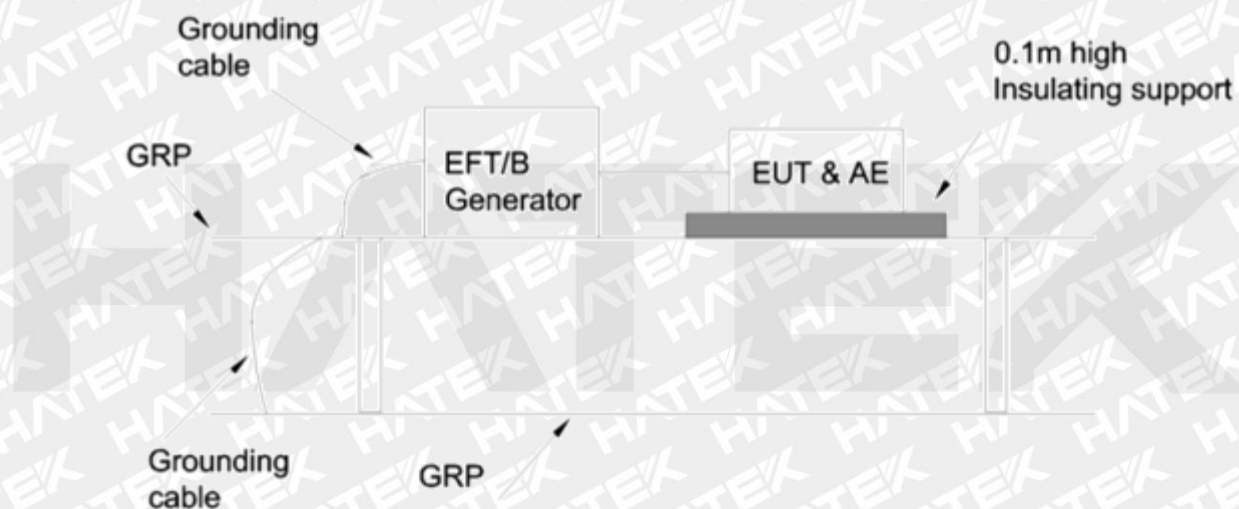
Position	Remarks	Result
EUT in vertical orientation	No change of luminous intensity	Pass
EUT in horizontal orientation	No change of luminous intensity	Pass

5.2 Input and Output Power Ports

5.2.1 Fast Transients / Burst

Test Voltage	: $\pm 1\text{kV}$
Polarity	: negative/positive
Repetition frequency	: 5kHz
Test duration	: $\geq 120\text{sec}$
Tr/Tn	: 5ns/50ns
Severity level	: 2
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 61547:2023. Test setup and the fast transient noise generator are according to EN 61000-4-4 which is specified by EN IEC 61547:2023.

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 x2m.

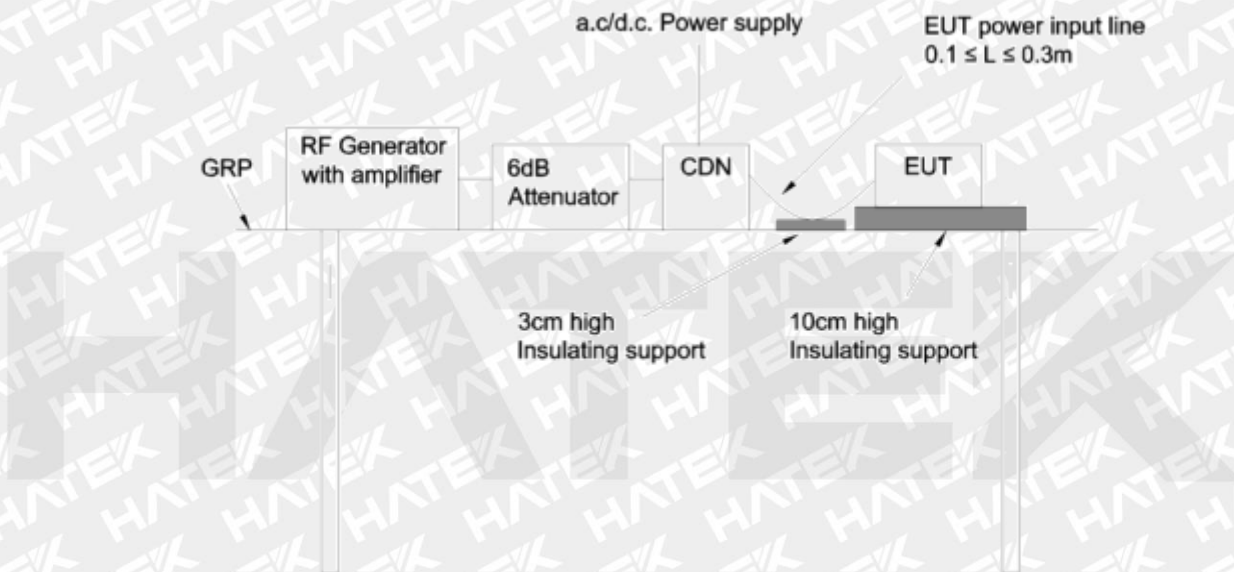
Table 5: Burst, AC Power lines, Positive and Negative Polarity

Coupling Method: Direct Injection			
Line	Test Voltage / Result		Remark
AC mains: L1 (L), L2 (N)	$\pm 1\text{Kv}$	Pass	No change of luminous intensity

5.2.2 Injected Current into

Voltage Level	: 3V(rms)(unmodulated)
Environmental phenomena	: r.f. current, common mode, 1kHz, 80%AM
Source impedance	: 150Ω
Frequency range	: 0.15-80 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 and DC power port was tested according to EN IEC 61547:2023 in a shielded room. The Test setup and the test generator are according to EN 61000-4-6 which is specified by EN IEC 61547:2023.

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.

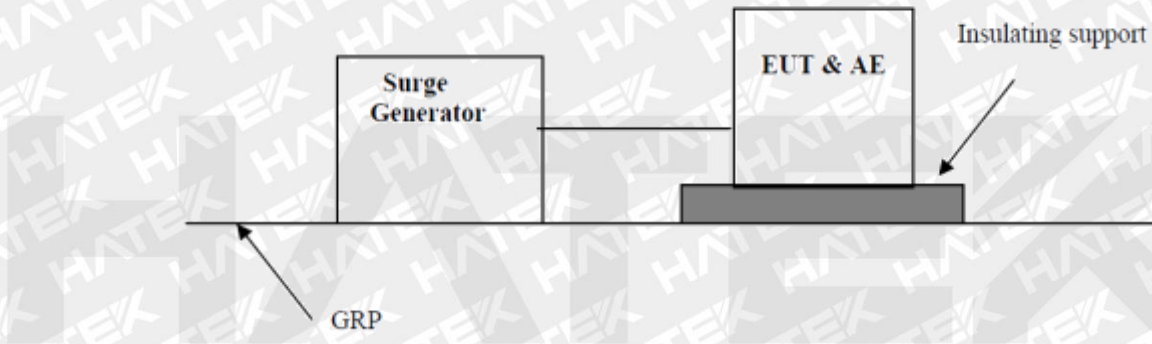
Table 6: Injected current, AC Power Port

Line	Coupling Method:	Remark	Result
AC Power Lines	CDN M-2	No change of luminous intensity	Pass

5.2.3 Surges

Test Level	:	phase to neutral $\pm 0.5\text{kV}$ phase/neutral to PE $\pm 0.5\text{kV}/\pm 1.0\text{kV}$ phase to neutral $\pm 0.5\text{kV}/\pm 1.0\text{kV}$ phase/neutral to PE $\pm 0.5\text{kV}/\pm 1.0\text{kV}/\pm 2.0\text{kV}$
Tr/Tn	:	1.2/50 μs (open-circuit voltage) 8/20 μs (short-circuit current)
Test numbers	:	5 positive and 5 negative pulses at phases of $\pm\pi/2$
Repetition rate	:	1/min
Performance criteria	:	C

Block Diagram of Test Set up



Test Procedure

The immunity against surges to AC and DC power port was tested in accordance to EN IEC 61547:2023. Test setup and the Combination Wave Generator (CWG) are according to EN 61000-4-5 which is specified by EN IEC 61547:2023.

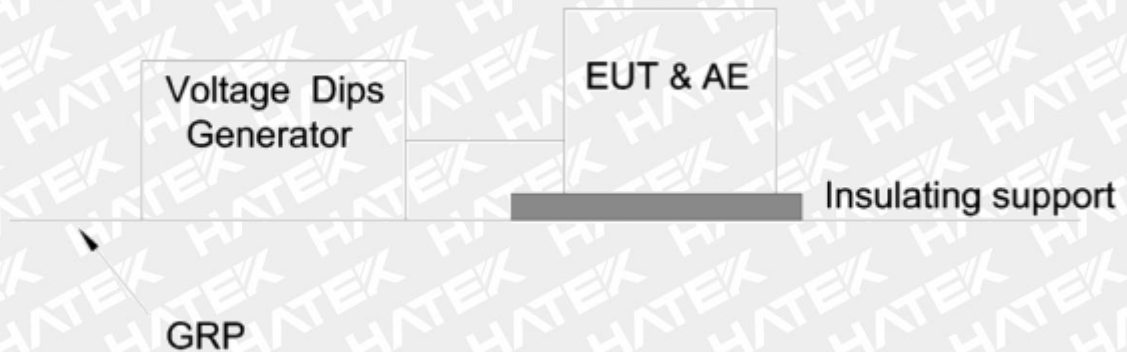
The EUT is placed on 0,1m wood table above the ground plane.

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

Line	Tested voltage/coupling phase	Test angle	Observation	Result
L1 to N	+1 kV, $+\pi/2$ (5 times)	90°	No change of luminous intensity	Pass
	-1 kV, $-\pi/2$ (5 times)	270°	No change of luminous intensity	Pass

5.2.4 Voltage dips and interruptions

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 61547:2023. Test setup and the test generator are according to EN 61000-4-11 which is specified by EN IEC 61547:2023. The EUT was placed directly on the table of aluminum.

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

Environmental Phenomena	Test level (in % UT)	Duration	Performance criteria
Interruptions	0	0,5 (10ms)	B
Voltage dip (in % UT) 30	70	10(200ms)	C

6 Photographs of the EUT and Test Set-Up

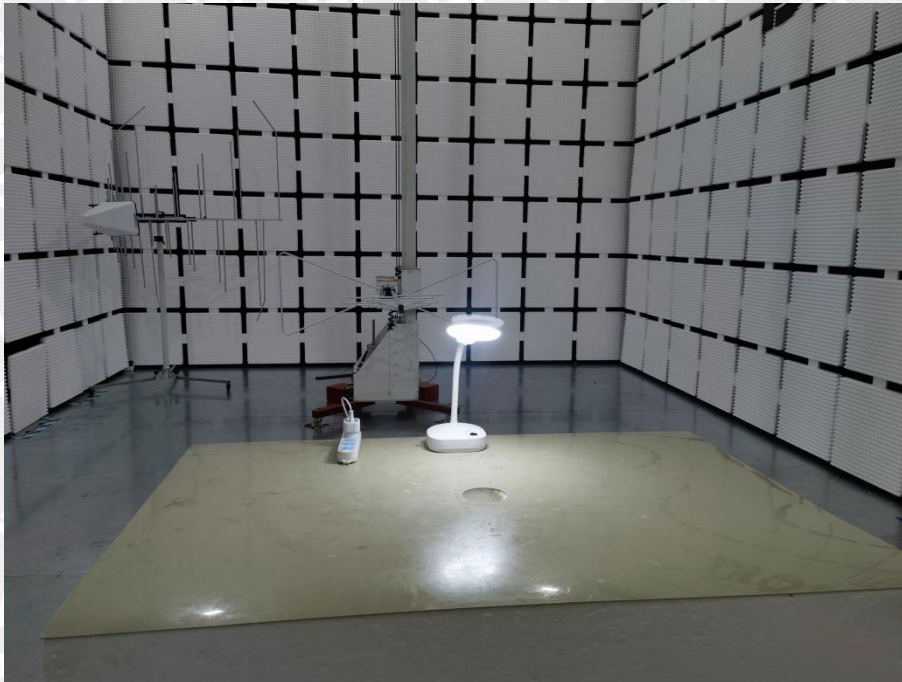
Photograph 1: Set-up for Disturbance Voltage



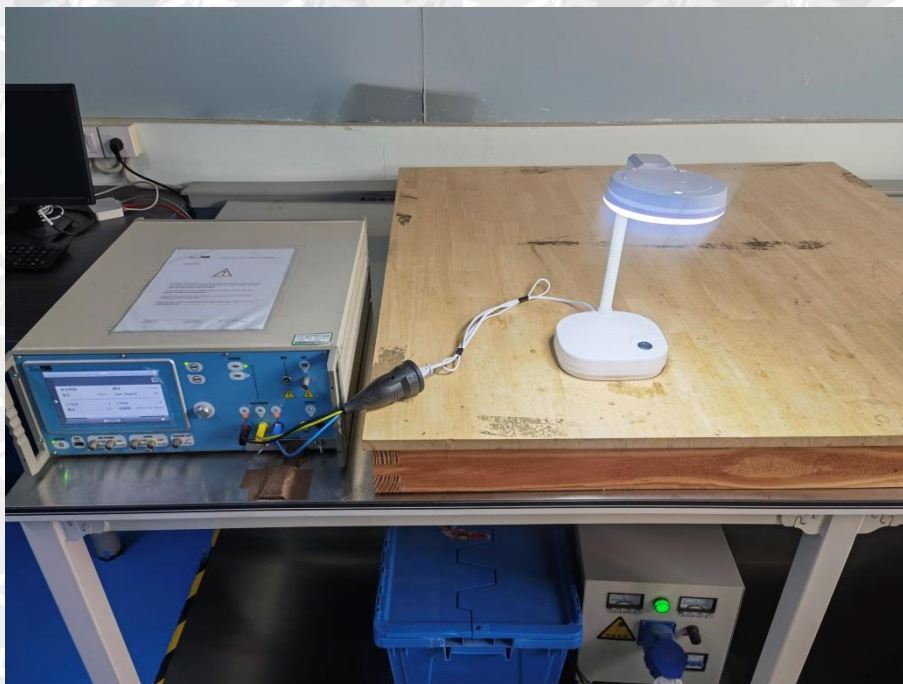
Photograph 2: Set-up for Harmonics, Voltage Fluctuation and Flicker



Photograph 3: Set-up for Radiated Emission



Photograph 4: Set-up for EFT, Surge and Voltage Dips



Photograph 5: Overall view of EUT (ZD-123 LED)



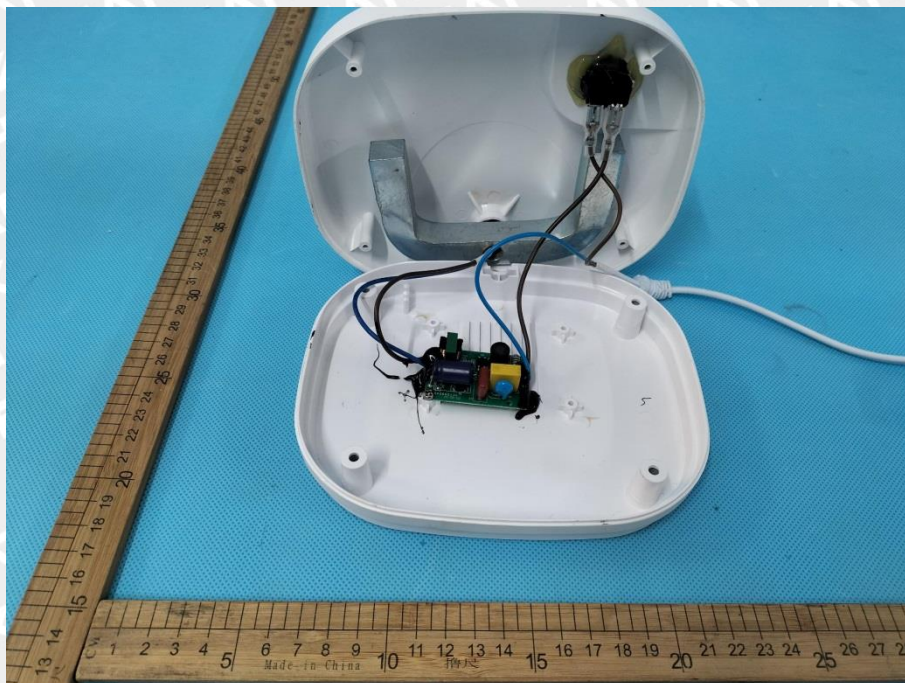
Photograph 6: Overall view of EUT (ZD-123 LED)



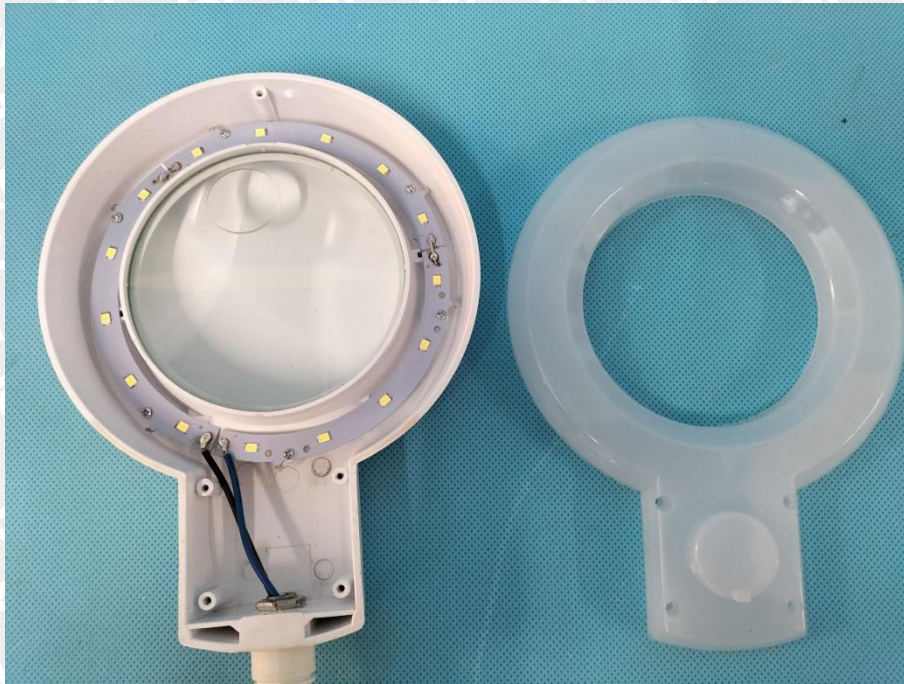
Photograph 7: Overall view of EUT (ZD-123 LED)



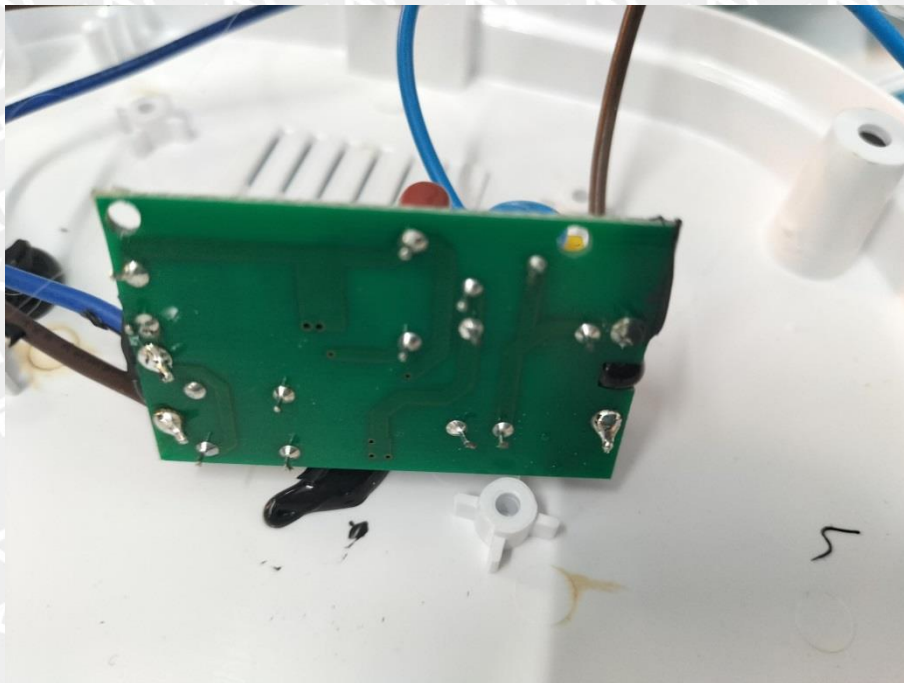
Photograph 8: Internal view of EUT (ZD-123 LED)



Photograph 9: Internal view of EUT (ZD-123 LED)



Photograph 10: Internal view of EUT (ZD-123 LED)



7 List of Tables

Table 1: List of Test and Measurement Equipment of Laboratory	5
Table 2: Harmonic currents measurement result	8
Table 3: ESD, Positive / Negative Polarity	24
Table 4: Radiated Susceptibility, Field Strength 3V/m	25
Table 5: Burst, AC Power lines, Positive and Negative Polarity	26
Table 6: Injected current, AC Power Port.....	27
Table 7: Surges to AC Power lines, positive/negative.....	28
Table 8: Test condition and Test Result for Voltage dips and Short interruptions	29

8 List of Figures

Figure 1: Spectral Diagrams, Conducted Emission, 0.009-30MHz, L.....	12
Figure 2: Spectral Diagrams, Conducted Emission, 0.009-30MHz, N	13
Figure 3: Graphic description of radiated electromagnetic disturbances, X direction	16
Figure 4: Graphic description of radiated electromagnetic disturbances, Y direction	17
Figure 5: Graphic description of radiated electromagnetic disturbances, Z direction	18
Figure 6: Spectral Diagrams, Radiated Emission, 30MHz-1000MHz, Horizontal	21
Figure 7: Spectral Diagrams, Radiated Emission, 30MHz-1000MHz, Vertical	22

9 List of Photographs

Photograph 1: Set-up for Disturbance Voltage	30
Photograph 2: Set-up for Harmonics, Voltage Fluctuation and Flicker.....	30
Photograph 3: Set-up for Radiated Emission	31
Photograph 4: Set-up for EFT, Surge and Voltage Dips.....	31
Photograph 5: Overall view of EUT (ZD-123 LED)	32
Photograph 6: Overall view of EUT (ZD-123 LED)	32
Photograph 7: Overall view of EUT (ZD-123 LED)	33
Photograph 8: Internal view of EUT (ZD-123 LED).....	33
Photograph 9: Internal view of EUT (ZD-123 LED).....	34
Photograph 10: Internal view of EUT (ZD-123 LED)	34

===== End of Test Report =====