

CE TEST REPORT

for

Voltage Protector

Model: HLP02, HLP01

Prepared for: Ningbo Cowell Eletronics & Technolog Co., Ltd.
Building 1, No. 59 Changxing RD., Jiangbei District, Hongtang,
Ningbo.China

Prepared by: Shenzhen NCT Testing Technology Co., Ltd
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Report Number: NCT24001051XE1-1
Date of Test: Jan. 04, 2024 ~ Jan. 11, 2024
Date of Issue: Jan. 11, 2024



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Shine Wu

Reported By: Keven Wu
Keven Wu

Reviewed By: Henry Wang
Henry Wang

The results detailed in this test report relate only to the specific sample(s) tested. It is the Application's responsibility to ensure that all production units are manufactured with equivalent EMC characteristics. This report is not to be reproduced except in full, without written approval from NCT Testing Technology.

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1.0 General Information

1.1 Client Information

Application:	Ningbo Cowell Eletronics & Technolog Co., Ltd.
Address of Application:	Building 1, No. 59 Changxing RD., Jiangbei District, Hongtang, Ningbo.China
Manufacturer:	Ningbo Cowell Eletronics & Technolog Co., Ltd.
Address of Manufacturer:	Building 1, No. 59 Changxing RD., Jiangbei District, Hongtang, Ningbo.China

1.2 General Description of E.U.T.

Product Name:	Voltage Protector
Model:	HLP02
Additional Model:	HLP01
Trade Mark:	N/A
Power Supply:	Input: AC 230~240V 50/60Hz 16A 3680W
Memo:	According client required.
Model Difference:	All models are same except the model name.
Remark:	This test report is only for the test of the main model of the prototype

1.3 Test Facility:

Name of Test Lab:	Shenzhen NCT Testing Technology Co., Ltd.
Address of Test Lab:	B2A101、 B2A201、 B2A202, Fuqiao 6th Area, Xintian Community, Fuhai Street, Baoan District, Shenzhen, China.
Telephone:	+86-400-8868-419
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2.0 List of Measurement Equipment					
Conducted emission					
Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
EMI Test Receiver	ESPI	101604	RS	2023/6/21	2024/6/20
LISN	ENV 216	102796	RS	2023/3/17	2024/3/16
LISN	VN1-13S	004023	CRANAGE	2023/6/21	2024/6/20
Radiated emission					
Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
EMI Test Receiver	ESCI	101178	RS	2023/6/21	2024/6/20
Spectrum Analyzer	N9020A	MY50510202	Agilent	2023/6/21	2024/6/20
Bilog Antenna	VULB9162	00473	SCHNARZBECK	2023/3/19	2025/3/18
Horn antenna	BBHA 9120 D	02622	SCHNARZBECK	2023/3/19	2025/3/18
Preamplifier	BBV 9718D	00042	SCHNARZBECK	2023/6/21	2024/6/20
Harmonic & Flicker					
Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
Harmonics Flicker Test System	AC200A	512369	LAPLACE	2023/6/21	2024/6/20
Electrostatic Discharge					
Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
Electostatic Discharge Generator	HESD 16	006315	HTEC	2023/6/26	2024/6/25
Continuous radiated disturbances(Keyway)					
Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
Bilog Antenna	3142D	00135452	ETS	2023/04/11	2024/04/10
Amplifier (80-1000MHz)	AP801000_250	MPA1708341	SKET	2023/04/10	2024/04/09
Amplifier (1-3GHz)	AP0103_75	MPA1708342	SKET	2023/04/10	2024/04/09
Amplifier (3-6GHz)	AP0206_50	MPA1708343	SKET	2023/04/10	2024/04/09
RF Switch	/	/	EMC TOYO	2023/04/10	2024/04/09
Power Sensor	/	MY41496069	Agilent	2023/04/10	2024/04/09
Signal Generator	N5181B	MY53050432	Agilent	2023/04/10	2024/04/09

EFT/Dip					
Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
Fast Transient Burst Simulator	HCOM PACT52	221003	HTEC	2023/6/21	2024/6/20
CYCLE SAG SIMULATOR	HV2P16T	221302	HTEC	2023/6/21	2024/6/20

Continuous conducted disturbances					
Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
Signal Generator	CDG-7000-25	10904-1	SCHLODER	2023/6/21	2024/6/20
Power Amplifier	CDG 6050-100	191103	SCHLODER	2023/6/21	2024/6/20
CDN	M2+3	210319	SCHLODER	2023/6/21	2024/6/20

Power-frequency Magnetic field					
Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
Continuous Wave Simulator	HMFG100	212305	HTEC	2023/6/21	2024/6/20

Surge					
Name	Model No.	Serial No.	Manufacturer	Date of Cal.	Due Date
Lightning Surge Generator	HOV 7000	222202	HTEC	2023/6/30	2024/6/29
Lightning Surge Generator	HIM 450	222201	HTEC	2023/6/30	2024/6/29
Lightning Surge Generator	SCDN161	222203	HTEC	2023/6/30	2024/6/29

3.0 Technical Details

3.1 Investigations Requested

Perform Electromagnetic Interference [EMI] & Electromagnetic Susceptibility [EMS] tests for CE Marking

3.2 Test Standards

EN IEC 55014-1:2021	Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus. Part 1: Emission
EN IEC 61000-3-2:2019+A1:2021	Electromagnetic compatibility(EMC)- Part 3-2:Limits-Limits for harmonic current emissions(equipment input current \leq 16A per phase)
EN 61000-3-3:2013/A2:2021	Electromagnetic compatibility (EMC)- Part 3-3:Limits-Limitation of voltage changes, Voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current \leq 16A per phase and not subject to conditional connection
EN IEC 55014-2:2021	Electromagnetic compatibility- Requirements for household appliances, electric tools and similar apparatus. Part 2: Immunity-Product family standard

3.3 Performance Criteria

- 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 specified by the manufacturer. The minimum level may be instead of that, either being derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.
- 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 specified by the manufacturer. During the test, degradation of performance is allowed, however, no change of actual operating state or stored data is allowed. The minimum level may be instead of that, either being derived from the product description and documentation, and from what the user may reasonably expect from the apparatus if used as intended.
- 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 instruction for use.

For further performance criteria details, please refer to Table 14 in EN 55014-2.

3.4 Test standards and Results Summary Tables

Test Condition	Test Requirement	Test Method	Test Result
EMISSION Results Summary			
Conducted Emission on AC Mains, 150KHz to 30MHz	EN IEC 55014-1	EN IEC 55014-1	Pass
Disturbance Power Test, 30 MHz to 300MHz	EN IEC 55014-1	EN IEC 55014-1	N/A
Radiated Emissions, 30MHz to 1000MHz	EN IEC 55014-1	EN IEC 55014-1	Pass
Harmonic Emissions on AC supply	EN IEC 61000-3-2	EN IEC 61000-3-2	Pass
Voltage fluctuations on AC supply	EN 61000-3-3	EN 61000-3-3	Pass
IMMUNITY Results Summary			
Electrostatic Discharge	EN IEC 55014-2	EN 61000-4-2	Pass
RF field strength susceptibility	EN IEC 55014-2	EN IEC 61000-4-3	Pass
Electrical Fast transients /Burst Immunity	EN IEC 55014-2	EN 61000-4-4	Pass
Surge	EN IEC 55014-2	EN 61000-4-5	Pass
Conducted susceptibility	EN IEC 55014-2	EN 61000-4-6	Pass
Dips/Voltage Interruption Variation	EN IEC 55014-2	EN IEC 61000-4-11	Pass

Note: N/A=Not applicable

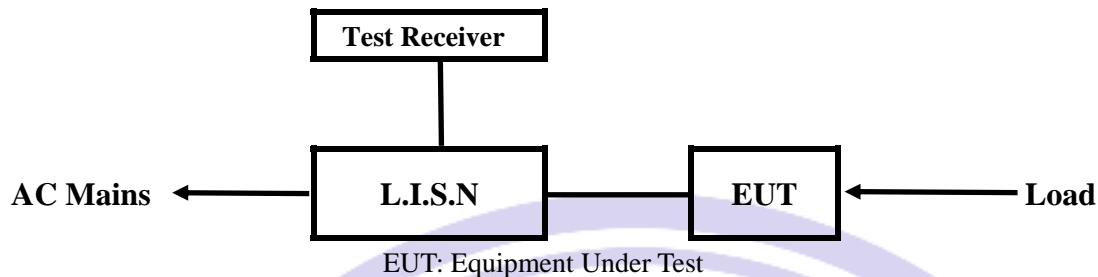
3.5 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	MU
1.	Temperature	±0.1°C
2.	Humidity	± 1.0%
3.	Spurious emissions, conducted	± 3.24dB
4.	All emissions, radiated	± 5.03dB

4.0 Electromagnetic Interference Test results

4.1 Power Line Conducted Emission Test

4.1.1 Schematics of the test



4.1.2 Test Method and test Procedure

The test was performed in accordance with EN IEC 55014-1

4.1.3 Test Equipment

Please refer to the Section 2

4.1.4 Power line conducted Emission Limit

Frequency(MHz)	Limits dB(μ V)	
	Quasi-peak Level	Average Level
0.15 ~ 0.50	66.0~56.0*	59.0~46.0*
0.50 ~ 5.00	56.0	46.00
5.00 ~ 30.00	60.0	50.00

- Notes:
- *decreasing linearly with logarithm of frequency.
 - The lower limit shall apply at the transition frequencies

4.1.5 Photo documentation of the test set-up

Please refer to the Section 7

4.1.6 Test specification:

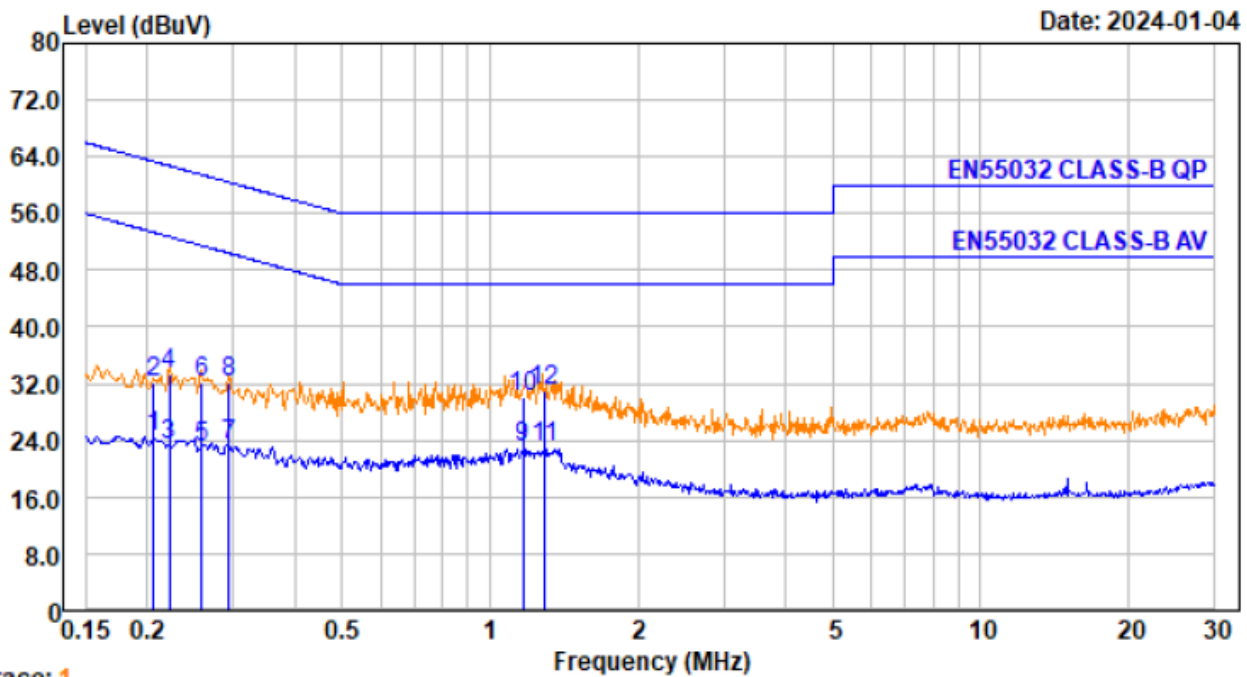
Environmental conditions: Temperature: 23° C Humidity: 54% Atmospheric pressure: 101kPa

Frequency range: 0.15 MHz – 30 MHz

4.1.7 Test result Pass

Remarks: According to the EN IEC 55014-1

A Conducted Emission on Live Terminal of the power line (150kHz to 30MHz)

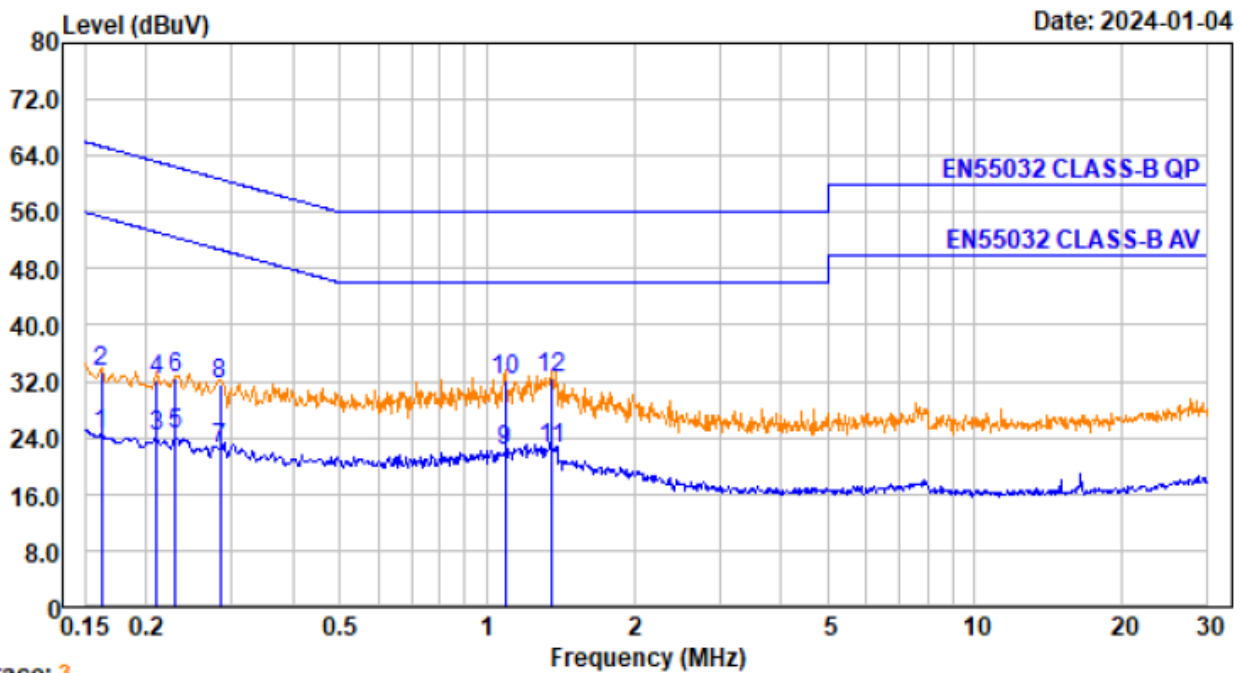


Trace: 1



No.	Freq MHz	Cable Loss dB	LISN Factor dB/m	Receiver Reading dBUV	Emission Level dBUV/m	Limit dBUV/m	Over Limit dB	Remark
1.	0.206	0.01	9.55	4.66	24.37	53.36	-28.99	Average
2.	0.206	0.01	9.55	12.60	32.31	63.36	-31.05	QP
3.	0.222	0.01	9.55	3.70	23.41	52.74	-29.33	Average
4.	0.222	0.01	9.55	13.70	33.41	62.74	-29.33	QP
5.	0.259	0.01	9.56	3.45	23.16	51.47	-28.31	Average
6.	0.259	0.01	9.56	12.39	32.10	61.47	-29.37	QP
7.	0.294	0.01	9.56	3.48	23.19	50.41	-27.22	Average
8.	0.294	0.01	9.56	12.39	32.10	60.41	-28.31	QP
9.	1.166	0.03	9.58	3.41	23.10	46.00	-22.90	Average
10.	1.166	0.03	9.58	10.40	30.09	56.00	-25.91	QP
11.	1.296	0.03	9.58	3.34	23.03	46.00	-22.97	Average
12.	1.296	0.03	9.58	11.30	30.99	56.00	-25.01	QP

B Conducted Emission on Neutral Terminal of the power line (150kHz to 30MHz)



Trace: 3

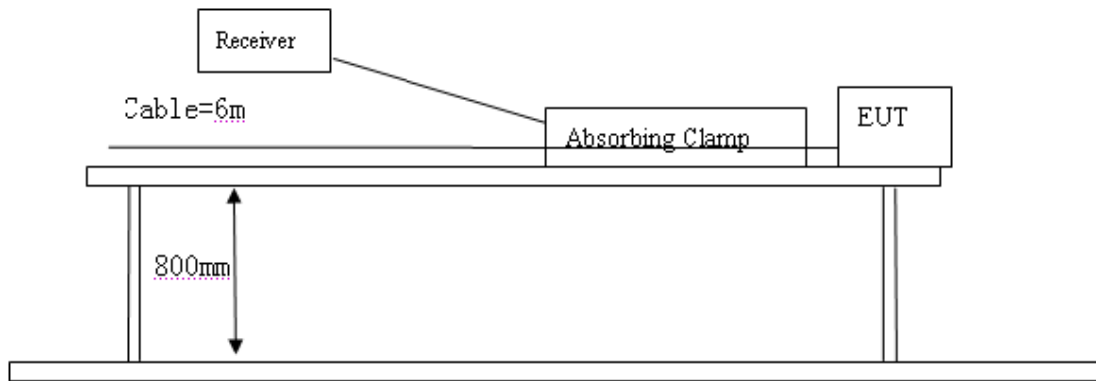
No.	Freq MHz	Cable Loss dB	LISN Factor dB/m	Receiver Reading dBuV	Emission Level dBuV/m	Limit dBuV/m	Over Limit dB	Remark
1.	0.162	0.00	9.54	4.80	24.50	55.34	-30.84	Average
2.	0.162	0.00	9.54	13.70	33.40	65.34	-31.94	QP
3.	0.211	0.01	9.55	4.45	24.16	53.18	-29.02	Average
4.	0.211	0.01	9.55	12.40	32.11	63.18	-31.07	QP
5.	0.230	0.01	9.55	4.84	24.54	52.44	-27.90	Average
6.	0.230	0.01	9.55	12.80	32.50	62.44	-29.94	QP
7.	0.283	0.01	9.56	2.82	22.53	50.72	-28.19	Average
8.	0.283	0.01	9.56	11.79	31.50	60.72	-29.22	QP
9.	1.088	0.02	9.58	2.45	22.14	46.00	-23.86	Average
10.	1.088	0.02	9.58	12.40	32.09	56.00	-23.91	QP
11.	1.359	0.03	9.58	2.81	22.50	46.00	-23.50	Average
12.	1.359	0.03	9.58	12.80	32.49	56.00	-23.51	QP

4.2 Disturbance Power Test

4.2.1 Test Method:

The test was performed in accordance with EN IEC 55014-1

Block diagram of Test setup



4.2.2 Test Equipment

Please refer to the Section 2

4.2.3 Power line conducted Emission Limit

Frequency(MHz)	Limits dB(pW)	
	Quasi-peak Level	Average Level
30 ~ 300	45~55	35~45

- Notes:
- *decreasing linearly with logarithm of frequency.
 - The lower limit shall apply at the transition frequencies

4.2.4 Photo documentation of the test set-up

Please refer to the Section 7

4.2.5 Test specification:

Environmental conditions: Temperature: 23° C Humidity: 54% Atmospheric pressure: 101kPa

Frequency range: 30 MHz – 300 MHz

4.2.6 Test result N/A

Remarks: According to the EN IEC 55014-1

A. Conducted Disturbance Power on AC Line (30MHz to 300MHz)

EUT Description: --
Operation Mode: --
Tested By: --
Test date: --
Test Result: --

Remark: The test item is not applicable.



B. Conducted Disturbance Power on DC Line (30MHz to 300MHz)

EUT Description: --
Operation Mode: --
Tested By: --
Test date: --
Test Result: --

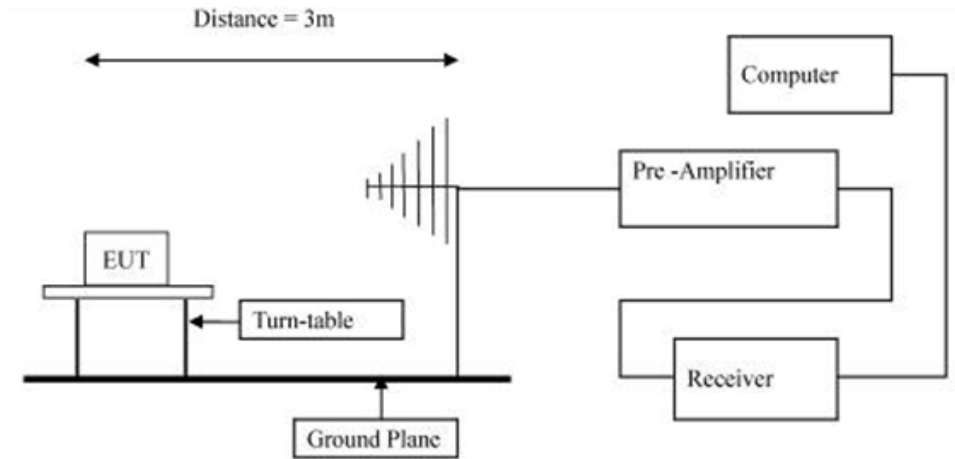
Remark: The test item is not applicable.



4.3 Radiated Emission Test

4.3.1 Test Method: The test was performed in accordance to EN IEC 55014-1

4.3.2 Block diagram of Test setup



4.3.3 Radiated Emission Limit

Frequency Range (MHz)	Distance (m)	Quasi-Peak limits (dB μ V/m)
30-230	3	40.00
230-1000	3	47.00

Note: The lower limit shall apply at the transition frequencies

4.3.4 Photo documentation of the test set-up

Please refer to the Section 7

4.3.5 Test Equipment:

Please refer to the Section 2

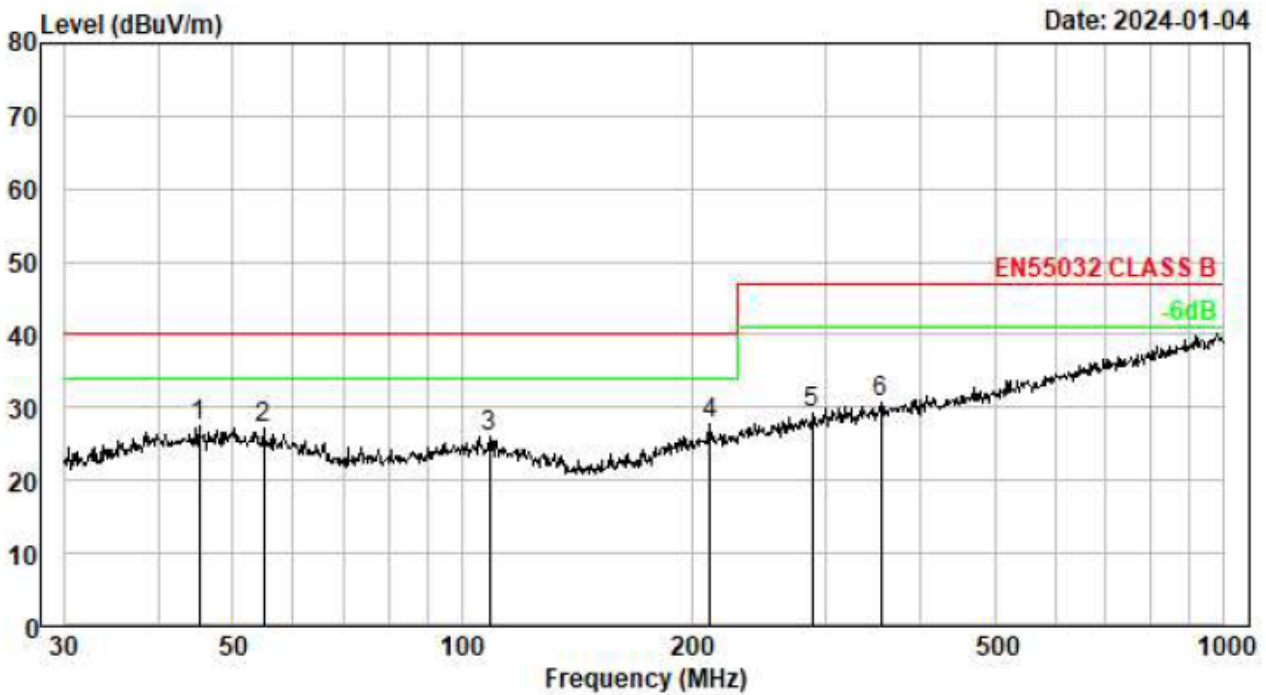
4.3.6 Test specification:

Environmental conditions: Temperature 23° C Humidity: 54% Atmospheric pressure: 101kPa

4.3.7 Test result Pass

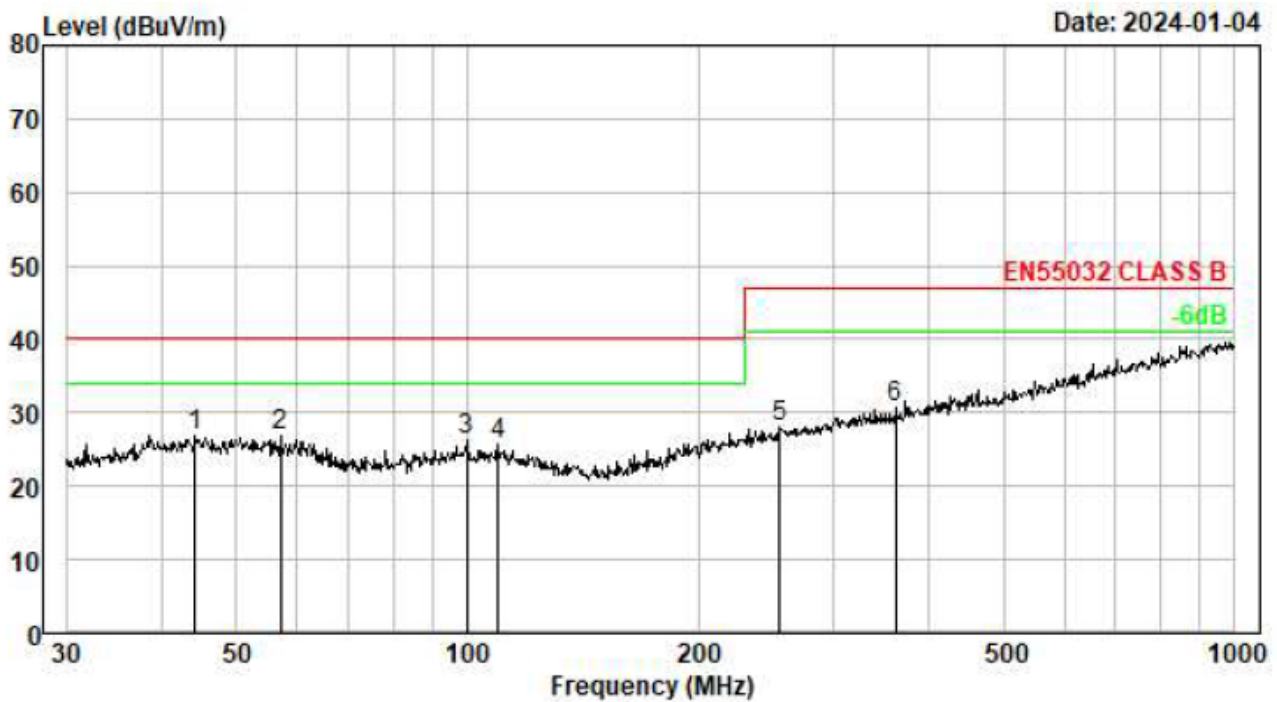
Remarks: According to the EN IEC 55014-1

A. Radiated Emission In Horizontal (30MHz----1000MHz)



No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Preamp Gain dB	Receiver Reading dBμV	Emission Level dBμV/m	Limit dBμV/m	Over Limit dB	Remark
1	45.217	0.39	12.61	0.00	14.47	27.47	40.00	-12.53	QP
2	54.835	0.47	12.19	0.00	14.62	27.28	40.00	-12.72	QP
3	108.647	0.73	11.19	0.00	13.94	25.86	40.00	-14.14	QP
4	211.527	1.09	11.80	0.00	14.95	27.84	40.00	-12.16	QP
5	287.990	1.26	14.01	0.00	13.90	29.17	47.00	-17.83	QP
6	354.183	1.37	15.17	0.00	14.25	30.79	47.00	-16.21	QP

B. Radiated Emission In Vertical (30MHz----1000MHz)



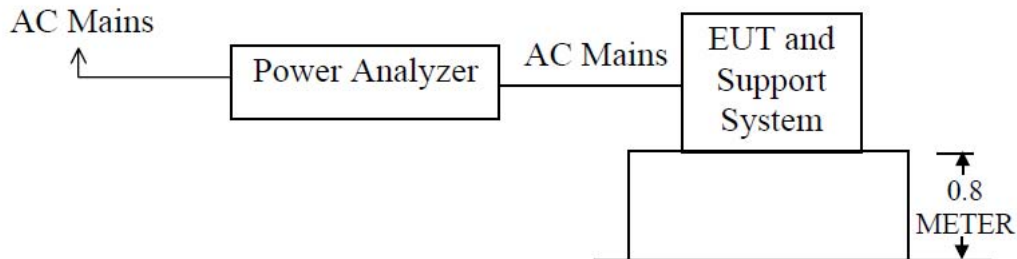
No.	Freq MHz	Cable Loss dB	ANT Factor dB/m	Preamp Gain dB	Receiver Reading dBμV	Emission Level dBμV/m	Limit dBμV/m	Over Limit dB	Remark
1	44.120	0.38	12.59	0.00	13.89	26.86	40.00	-13.14	QP
2	56.991	0.48	11.98	0.00	14.42	26.88	40.00	-13.12	QP
3	99.878	0.69	11.09	0.00	14.50	26.28	40.00	-13.72	QP
4	109.796	0.74	11.20	0.00	13.73	25.67	40.00	-14.33	QP
5	255.623	1.19	13.16	0.00	13.62	27.97	47.00	-19.03	QP
6	361.714	1.38	15.28	0.00	14.02	30.68	47.00	-16.32	QP

4.4 Harmonic Current Emissions

4.4.1 EUT Operating Mode

Full load

4.4.2 Block Diagram of Test Setup.



This test was performed as per EMC Basic Standard EN IEC 61000-3-2 Class A

4.4.3 Test Equipment

Please refer to Section 2 this report.

4.4.4 Test specification:

Environmental conditions: Temperature: 23° C Humidity: 54% Atmospheric pressure: 101kPa

4.4.5 Results

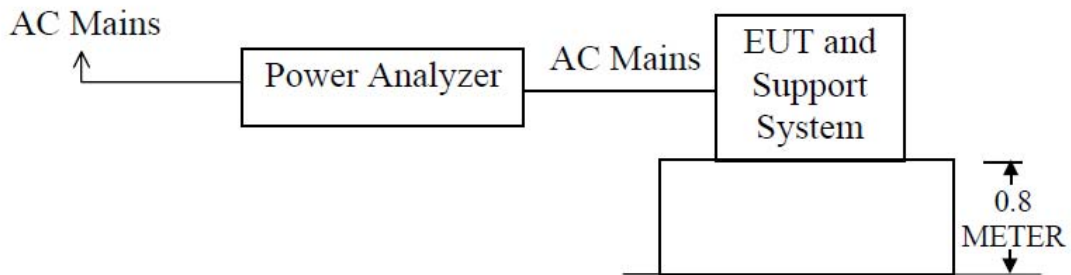
Port	EUT Operating mode	Result (Passed / Failed)
AC Input	Full load	Passed

4.5 Flicker and Voltage Fluctuation

4.5.1 EUT Operating Mode

Full load

4.5.2 Block Diagram of Test Setup.



This test was performed as per EMC Basic Standard EN 61000-3-3

4.5.3 Limits of Voltage Fluctuation and Flicks Measurement

Test Item	Limit	Note
P_{st}	1.0	Pst means short-term flicker indicator
P_{lt}	0.65	Plt means long-term flicker indicator
T_{dt} (ms)	200	Tdt means maximum time that dt exceeds 3.3%.
d_{max} (%)	4	Dmax means maximum relative voltage change.
dc (%)	3.3	Dc means relative steady-state voltage change.

4.5.4 Test Equipment

Please refer to Section 2 this report.

4.5.5 Test specification:

Environmental conditions: Temperature: 23° C Humidity: 54% Atmospheric pressure: 101kPa

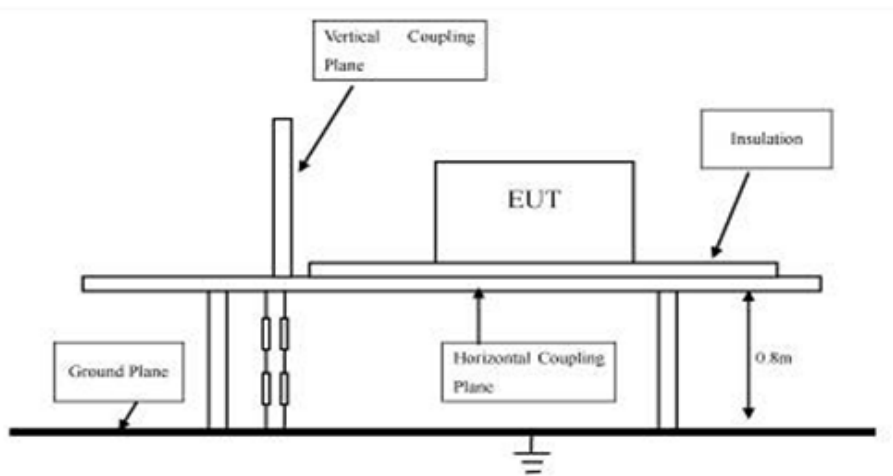
4.5.6 Results

Port	EUT Operating mode	Result (Passed / Failed)
AC Input	Full load	Pass

5.0 Immunity Test

5.1 Electrostatic Discharge

5.1.1 Schematic of the test



5.1.2 Test method

The test was performed in accordance with EN 61000-4-2

5.1.3 Test severity

±4kV for direct & in-direct Contact Discharge

±8kV for air Discharge

Performance Criterion Require: **B**

5.1.4 Test Equipment

Please refer to Section 2 this report.

5.1.5 Test specification:

Environmental conditions: Temperature: 23° C Humidity: 54% Atmospheric pressure: 101kPa

5.1.6 Operation mode:

Working

5.1.7 Discharge location

- HCP
- VCP
- Shell

5.1.8 Test Result

Pass

5.2 RF field strength susceptibility (80MHz----- 1000MHz)

5.2.1 Test Method:

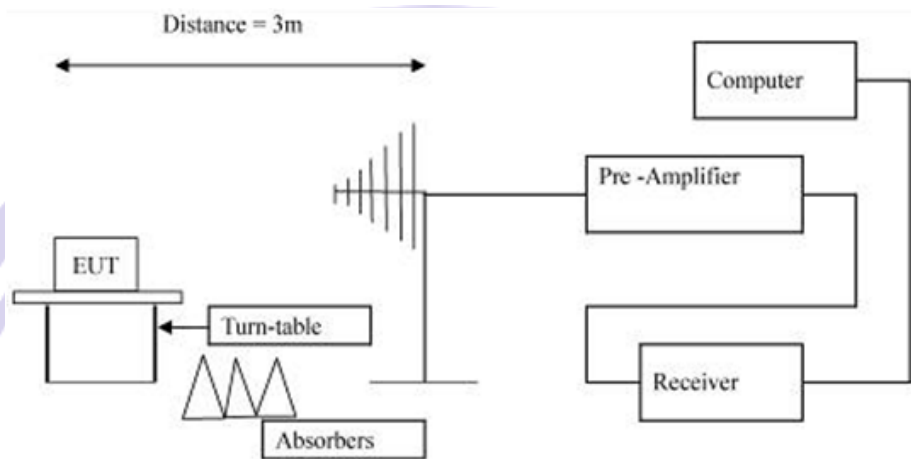
The test was performed in accordance with EN IEC 61000-4-3

Severity: Level 2 (3V/m)

Modulation: 1 KHz 80% AM

Performance Criterion Require: A

Block diagram of Test setup



5.2.2 Test Equipment

Please refer to Section 2 this report.

5.2.3 Test specification:

Environmental conditions: Temperature: 23° C Humidity: 54% Atmospheric pressure: 101kPa

5.2.4 Operation mode: Working

5.2.5 Test Result:

Please refer to the following table for individual results.

Frequency (MHz)	Radiation to	Polarity	Level (V/m)	Dwell Time(s)	Sweep Rate (%)	Results
80-6000	Front	Horizontal	3	1	1	Pass
80-6000	Rear	Horizontal	3	1	1	Pass
80-6000	Left	Horizontal	3	1	1	Pass
80-6000	Right	Horizontal	3	1	1	Pass
80-6000	Front	Vertical	3	1	1	Pass
80-6000	Rear	Vertical	3	1	1	Pass
80-6000	Left	Vertical	3	1	1	Pass
80-6000	Right	Vertical	3	1	1	Pass

5.3 Electrical Fast Transient/Burst (EFT/B) immunity test

5.3.1 Schematics of the test



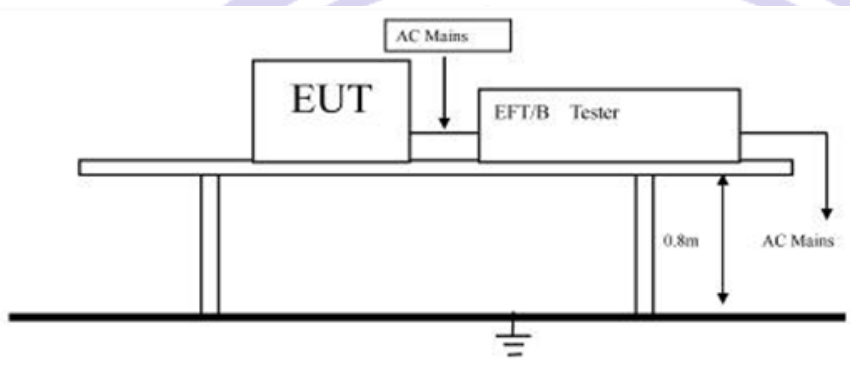
5.3.2 Test Method

The test was performed in accordance with EN 61000-4-4

Severity: Level 2 (1kV)

Performance Criterion Require: **B**

Block diagram of Test setup



5.3.3 Test Equipment

Please refer to Section 2 this report.

5.3.4 Test specification:

Environmental conditions: Temperature: 23° C Humidity: 54% Atmospheric pressure: 101kPa

5.3.5 Operation mode:

Working

5.3.6 Test Results

Inject location: AC mains

Inject Line	Voltage kV	Inject Times (s)	Method	Results
L	±1	120	Direct	Pass
N	±1	120	Direct	Pass
L、N	±1	120	Direct	Pass
E	±1	120	Direct	Pass
L、E	±1	120	Direct	Pass
N、E	±1	120	Direct	Pass
L、N、E	±1	120	Direct	Pass

Note: N/A=Not applicable

5.4 Surge test

5.4.1 Schematics of the test



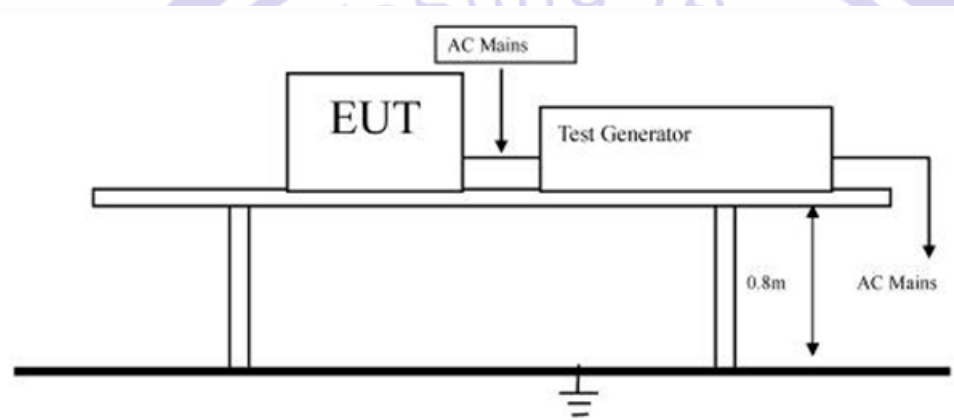
5.4.2 Test Method:

The test was performed in accordance with EN 61000-4-5

Severity: Level 2

Performance Criterion Require: B

Block diagram of Test setup



5.4.3 Test Equipment

Please refer to Section 2 this report.

5.4.4 Test specification:

Environmental conditions: Temperature: 23° C Humidity: 54% Atmospheric pressure: 101kPa

5.4.5 Operation mode: Working

5.4.6 Test Results

5 pulses for each polarity and test voltage, and repetition rate is 1 per min.

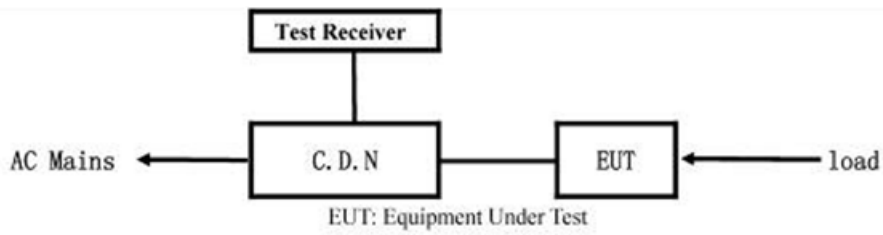
Location	Polarity	0°	90°	180°	270°	Results
L-N	+1 KV	N/A	n.r.r.	N/A	N/A	Pass
	-1 KV	N/A	N/A	N/A	n.r.r.	Pass
L-PE	+2 KV	N/A	n.r.r.	N/A	N/A	Pass
	-2 KV	N/A	N/A	N/A	n.r.r.	Pass
N-PE	+2 KV	N/A	n.r.r.	N/A	N/A	Pass
	-2 KV	N/A	N/A	N/A	n.r.r.	Pass

Remark: 1) n.r.r. = no reaction recognized, N/A = not applicable.

2) Performance Criteria A Observed.

5.5 Conducted immunity test

5.5.1 Schematics of the test



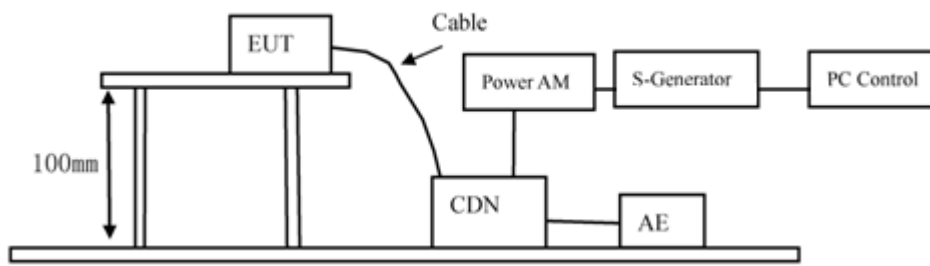
5.5.2 Test Method

The test was performed in accordance with EN 61000-4-6

Severity: Level 2 (3 V rms),

Performance Criterion Require: A

Block diagram of Test setup



5.5.3 Test Equipment

Please refer to Section 2 this report.

5.5.4 Test specification:

Environmental conditions: Temperature: 23° C Humidity: 54% Atmospheric pressure: 101kPa

5.5.5 Operation mode:

Working

5.5.6 Test Results:

Frequency Range (MHz)	Injected Position	Strength	Criterion	Result
0.15 - 80	AC Line	3V (rms) Unmodulated	A	Pass
80-230	AC Line	3V (rms) Unmodulated	A	Pass

5.6 Voltage Dips/Interruptions immunity test

5.6.1 Schematics of the test

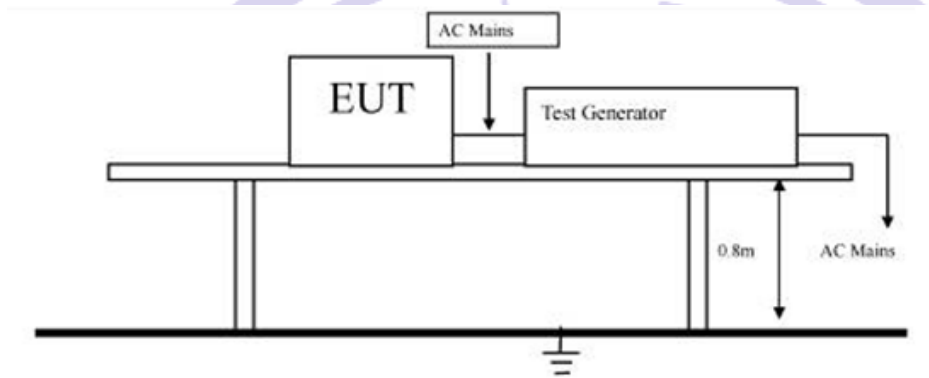


5.6.2 Test Method:

The test was performed in accordance with EN IEC 61000-4-11

Performance Criterion Require: C&B

Block diagram of Test setup



5.6.3 Test Equipment

Please refer to Section 2 this report.

5.6.4 Test specification:

Environmental conditions: Temperature: 23° C Humidity: 54% Atmospheric pressure: 101kPa

5.6.5 Operation mode: Working

5.6.6 Test Result:

Test Level % Ut	Voltage dips & short interruptions % Ut	Duration(in period)	Phase Angle	Criterion	Result
50Hz					
0	100	0.5P	0° - 360°	B	Pass
40	60	10P	0° - 360°	C	Pass
70	30	25P	0° - 360°	C	Pass
60Hz					
0	100	0.5P	0° - 360°	B	Pass
40	60	12P	0° - 360°	C	Pass
70	30	30P	0° - 360°	C	Pass

6.0 CE Label

6.1 label specification

Text of the mark is black or white in color and is left justified. Labels are printed in indelible ink on permanent adhesive backing and shall be affixed at a conspicuous location on the EUT or silk-screened onto the EUT.

CE

6.2 Mark Location: On the product body



7.0 Photos of testing

Conducted Emission Test View



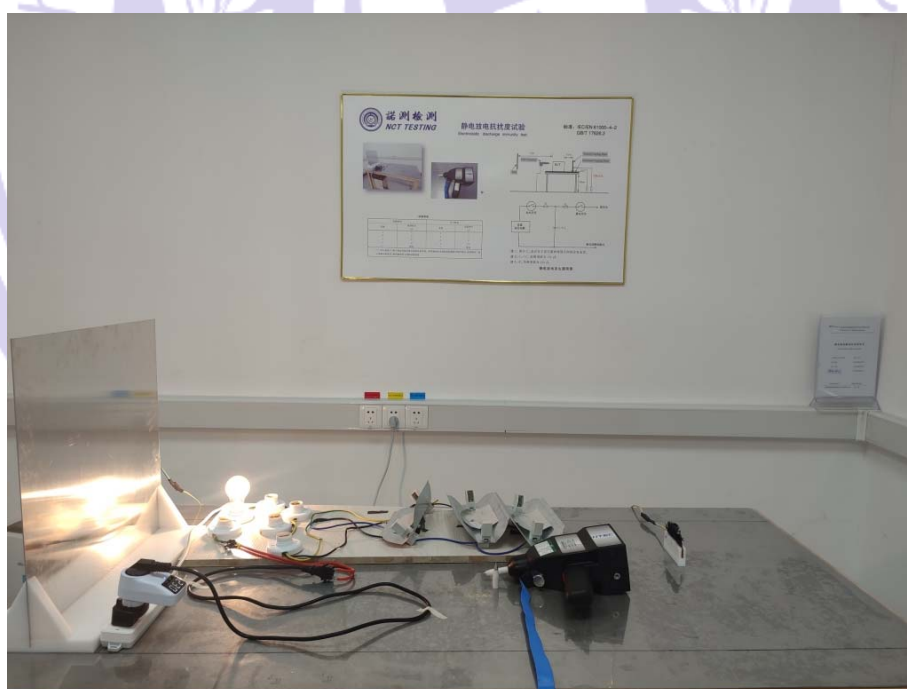
Radiated Emission Test View



H/F Test View



ESD Test View



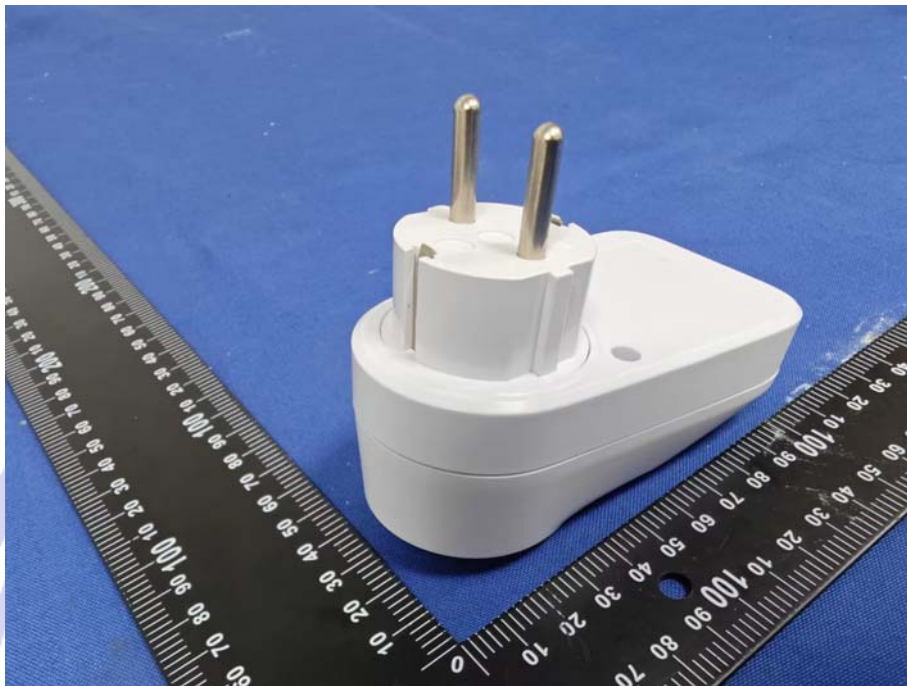
EFT/Dips Test View

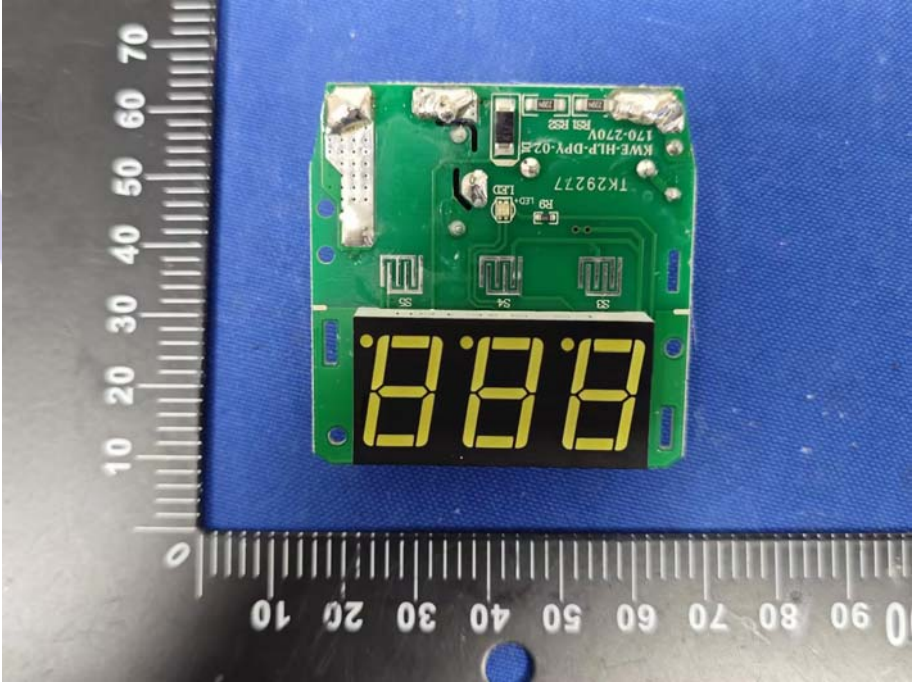
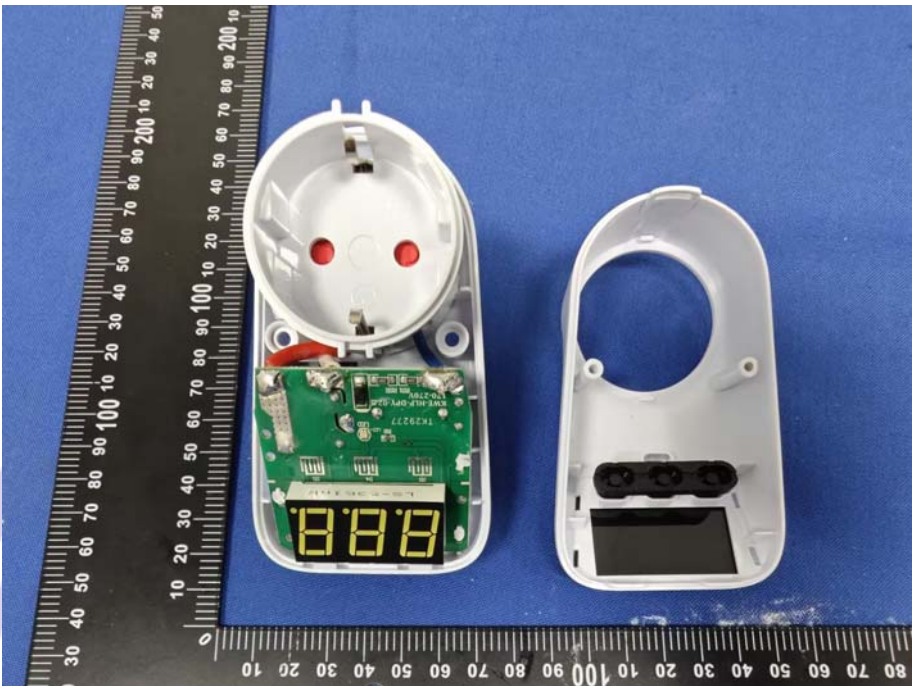


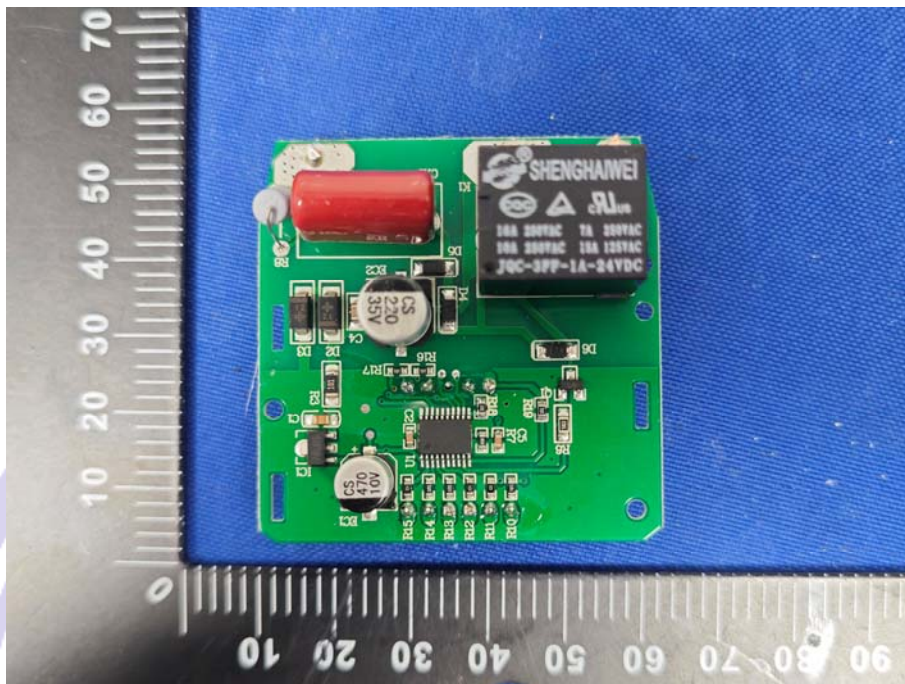
Surge Test View



8.0 Photographs – E.U.T.







--End of the report--