EMC TEST REPORT

Reference No.	:	SZLC20221202-1CHE
Applicant	:	3N AYDINLATMA ENERJI PROJE VE DANISMANLIK SAN TIC. LTD. STI.
Address	:	IOSB MAHALLESI ESKI TURGUT OZAL CADDESI NO: 10 A BLOK KAPI NO: 601 BASAKSEHIR/ISTANBUL, TÜRKIYE
Manufacturer	:	CH LIGHTING TECHNOLOGY CO., LTD.
Address	:	CH Industrial Park, Xietang Town, Shangyu Area Shaoxing City, 312369 Zhejiang, P.R. China
Product Name	:	Double-capped retrofit LED lamp (LED T5 lamp)
Model No	:	CH1356HE-15-17W
Standards	:	EN 55015:2019+A11:2020 EN 61547:2009 EN 61000-3-2:2019+A1:2021 EN 61000-3-3:2013+A1:2019+A2:2021
Date of Receipt sample	:	2022-12-05
Date of Test	:	2022-12-05 ~ 2022-12-12
Date of Issue	:	2023-01-06
Test Result	:	**Pass** *

Remarks:
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TEST SUMMARY

EMISSION	
Test Item	Result
Harmonics on AC Mains	Pass
Voltage Fluctuations on AC Mains	Pass
Mains Terminal Continuous Disturbance Voltage	Pass
Radiated Electromagnetic Disturbance (9 kHz-30 MHz)	Pass
Radiated Electromagnetic Disturbance (30 – 1000 MHz)	Pass
IMMUNITY	
Test Item	Result
Electrostatic Discharge	Pass
Radio Frequency Electromagnetic Field	Pass
Power frequency magnetic field	Pass
Fast Transients on AC Power Line	Pass
Injected Current into AC Power Port	Pass
Power-frequency magnetic Field	Pass
Surges to AC Power Port	Pass
Voltage dips and interruptions to AC Power Port	Pass

Contents

1 General Product Information

1.1 Product Function and Intended Use

The EUT (equipment under test) is ordinary LED T5 lamp for lighting and similar use. For the further information, refer to the user’ s manual.

1.2 Ratings and System Details

Model	:	CH1356HE-15-17W
Rated voltage	:	20-100V~, 25-75kHz, G5 Cap, Ta 45°C, 2700-6500K, Class II
Rated power	:	17W
Trademark	:	3N AYDINLATMA

The EUT has been tested as an independent unit. CH1356HE-15-17W is the test sample. The tests were performed in the condition of AC 230V/50Hz input to electronic ballast, then supplied to the product.

1.3 Independent Operation Modes

The basic operation modes are: “On” or “Off”.

1.4 Noise Generating and Noise Suppressing Parts

Refer to the circuit diagram for further information.

1.5 Submitted Documents

Rating label and circuit diagram.

2 Test Set-up and Operation Modes

2.1 Principle of Configuration Selection

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

Refer to the related paragraph of this report.

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

Refer to the related paragraph of this report.

2.2 Physical Configuration for Testing

Refer to the related paragraph of this report.

2.3 Test Operation and Test Software

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

2.4 Special Accessories and Auxiliary Equipment

None.

2.5 Countermeasures to achieve EMC Compliance

Refer to the circuit diagrams for further information.

3 Conformity Decision Rule

For all EMI tests (when included in this report), as measurement uncertainties are less than the values UCISPR 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.

4 Test Results EMISSION

4.1 Emission in the Frequency Range up to 30 MHz

4.1.1 Harmonics on AC Mains

Test procedure	:	EN IEC 61000-3-2:2019+A1
Test duration	:	2.5 min
Harmonic order	:	2 – 40th
Ambient Condition	:	Temperature: 25.5 ^{o}C; Relative Humidity: 38.6 %
Test result	:	Pass

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

Table 1: Harmonic currents measurement result

Class C
V_RMS (Volts): 230.39 **Frequency(Hz): 50.0001**
Power (Watts): 21.0 **Power Factor: 0.904**

Harm No.	Harm. Ave.	Harm. Limit (100%)	% Of Limits	Result (Ave.)	Result (Max.)	Harm. Win.	Harm. Win. (150%)	% Of Max
2	0.0010	0.0021	48.8	PASS	PASS	0.0012	0.0031	38.0
3	0.0025	0.0312	7.9	PASS	PASS	0.0027	0.0468	5.7
4	0.0014	0.0104	13.0	PASS	PASS	0.0016	0.0156	10.1
5	0.0020	0.0104	19.3	PASS	PASS	0.0023	0.0156	14.4
6	0.0014	0.0073	18.6	PASS	PASS	0.0015	0.0109	14.0
7	0.0018	0.0073	25.2	PASS	PASS	0.0020	0.0109	18.5
8	0.0013	0.0052	25.8	PASS	PASS	0.0015	0.0078	19.3
9	0.0018	0.0052	35.1	PASS	PASS	0.0020	0.0078	25.8
10	0.0013	0.0031	43.2	PASS	PASS	0.0015	0.0047	32.4
11	0.0017	0.0031	54.7	PASS	PASS	0.0019	0.0047	40.2
12	0.0013	0.0031	42.9	PASS	PASS	0.0015	0.0047	32.1
13	0.0017	0.0031	54.8	PASS	PASS	0.0019	0.0047	41.0
14	0.0014	0.0031	44.0	PASS	PASS	0.0015	0.0047	32.4
15	0.0016	0.0031	52.6	PASS	PASS	0.0018	0.0047	38.3
16	0.0014	0.0031	43.7	PASS	PASS	0.0015	0.0047	32.8
17	0.0016	0.0031	51.7	PASS	PASS	0.0018	0.0047	38.5
18	0.0013	0.0031	43.1	PASS	PASS	0.0015	0.0047	32.3
19	0.0016	0.0031	50.5	PASS	PASS	0.0018	0.0047	37.5
20	0.0014	0.0031	43.4	PASS	PASS	0.0015	0.0047	31.9
21	0.0015	0.0031	49.5	PASS	PASS	0.0017	0.0047	36.7
22	0.0014	0.0031	43.8	PASS	PASS	0.0015	0.0047	32.1
23	0.0015	0.0031	48.1	PASS	PASS	0.0017	0.0047	35.6
24	0.0014	0.0031	43.8	PASS	PASS	0.0015	0.0047	32.8
25	0.0015	0.0031	48.1	PASS	PASS	0.0017	0.0047	35.5
26	0.0014	0.0031	43.8	PASS	PASS	0.0015	0.0047	32.9
27	0.0015	0.0031	46.6	PASS	PASS	0.0016	0.0047	34.1
28	0.0014	0.0031	43.9	PASS	PASS	0.0015	0.0047	32.5
29	0.0014	0.0031	46.2	PASS	PASS	0.0016	0.0047	34.3
30	0.0014	0.0031	43.7	PASS	PASS	0.0016	0.0047	33.1
31	0.0014	0.0031	46.2	PASS	PASS	0.0016	0.0047	33.7
32	0.0014	0.0031	44.6	PASS	PASS	0.0015	0.0047	32.9
33	0.0014	0.0031	45.5	PASS	PASS	0.0016	0.0047	33.4
34	0.0014	0.0031	44.7	PASS	PASS	0.0016	0.0047	33.4
35	0.0014	0.0031	45.6	PASS	PASS	0.0016	0.0047	34.0
36	0.0014	0.0031	44.6	PASS	PASS	0.0016	0.0047	33.1
37	0.0014	0.0031	45.5	PASS	PASS	0.0017	0.0047	35.7
38	0.0014	0.0031	44.4	PASS	PASS	0.0015	0.0047	32.7
39	0.0014	0.0031	45.4	PASS	PASS	0.0016	0.0047	34.5
40	0.0010	0.0031	32.9	PASS	PASS	0.0012	0.0047	25.3

4.1.2 Voltage Fluctuations on AC Mains

Test procedure	:	EN 61000-3-3:2013+A1+A2
Test result	:	Pass

Due to the low power characteristic of the sample, it cannot produce voltage fluctuations and flicker exceeding the limits, thus the sample is deemed to meet the requirements of EN 61000-3-3:2013+A1 without actual test.

4.1.3 Mains Terminal Continuous Disturbance Voltage

Basic standard	:	EN 55015: 2019+A11
Frequency range	:	9 kHz – 30 MHz
Limit	:	EN 55015: 2019+A11, clause 4.3, Table 1
Kind of test site	:	shielded room
Ambient Condition	:	Temperature: 25.9 °C; Relative Humidity: 39.3 %
Expanded measurement uncertainty (*k*=2)	:	3.79 dB (9 – 150 kHz) 3.39 dB (150 kHz – 30 MHz)
Test result	:	Pass

Test Setup

Input voltage	:	AC 230 V, 50 Hz
Operational mode	:	Power on
Earthing	:	No Earthed. (as class II equipment)
Test setup	:	According to clause 8 of EN 55015:2019+A11

The measurement setup was made according to EN 55015:2019+A11 in a shielded 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 55015:2019+A11. The tested object was operated under its rated voltage and its rated frequency.

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

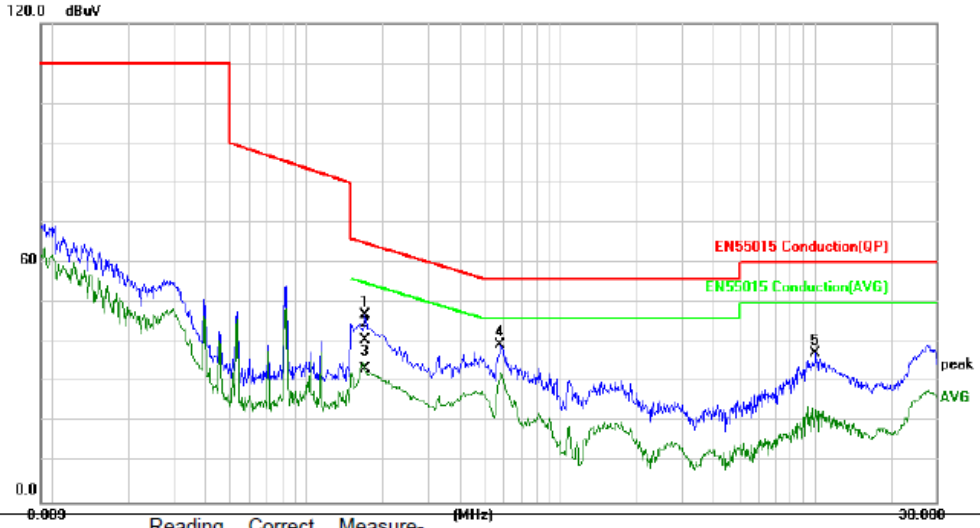
Each tested lamp was operated for at least 15 min before test.

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

The following figures and tables were those measured by an automatic measuring system. The disturbance voltage was scanned firstly with Peak detector and during the test. 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.

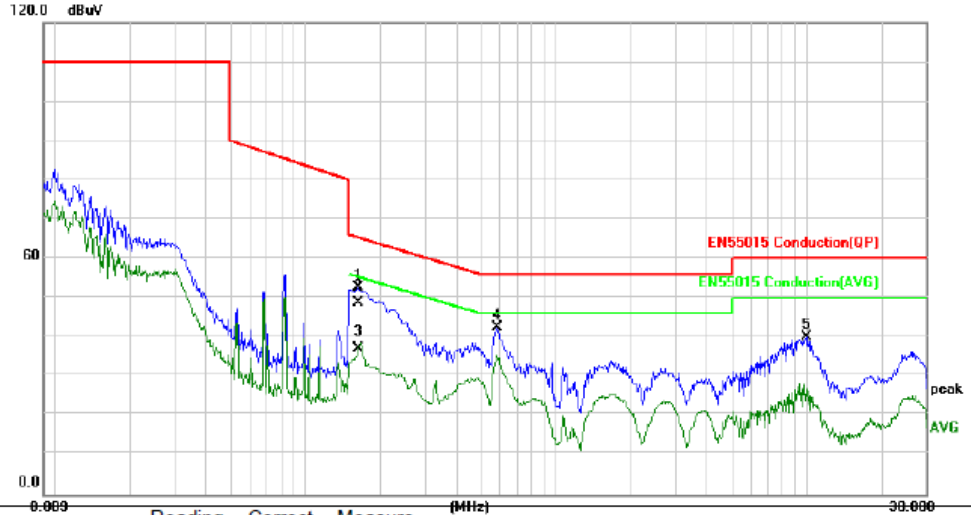
The following figures and tables were those measured by an automatic measuring system. Both Quasi-Peak and Average Value were measured. Quasi-Peak and Average Value were measured and listed respectively where they had a maximum in previous scanning survey.

Figure 1: Spectral Diagrams, Conducted Emission, AC mains terminal, 9 kHz – 30 MHz, L



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1		0.1700	36.39	10.67	47.06	64.96	-17.90	peak	
2		0.1700	29.96	10.67	40.63	64.96	-24.33	QP	
3		0.1700	22.67	10.67	33.34	54.96	-21.62	AVG	
4	*	0.5820	28.74	10.73	39.47	56.00	-16.53	peak	
5		10.0860	24.96	12.30	37.26	60.00	-22.74	peak	

Figure 2: Spectral Diagrams, Conducted Emission, AC mains terminal, 9 kHz – 30 MHz, N



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		
		MHz	dBuV	dB	dBuV	dBuV	dB	Detector	Comment
1	*	0.1620	41.93	10.80	52.73	65.36	-12.63	peak	
2		0.1620	37.82	10.80	48.62	65.36	-16.74	QP	
3		0.1620	26.25	10.80	37.05	55.36	-18.31	AVG	
4		0.5860	31.51	10.86	42.37	56.00	-13.63	peak	
5		9.9940	27.71	12.33	40.04	60.00	-19.96	peak	

4.1.4 Radiated Electromagnetic Disturbance (9 kHz-30 MHz)

Port	:	Enclosure
Basic standard	:	EN 55015: 2019+A11
Frequency range	:	9 kHz – 30 MHz
Limit	:	EN 55015: 2019+A11, clause 4.5
Ambient Condition	:	Temperature: 25.9 °C; Relative Humidity: 39.3 %
Expanded measurement uncertainty (*k*=2)	:	3.16 dB
Test result	:	Pass

Test Setup

Input voltage	:	AC 230 V, 50 Hz
Operational mode	:	Power on
Earthing	:	No Earthed. (as class II equipment)

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

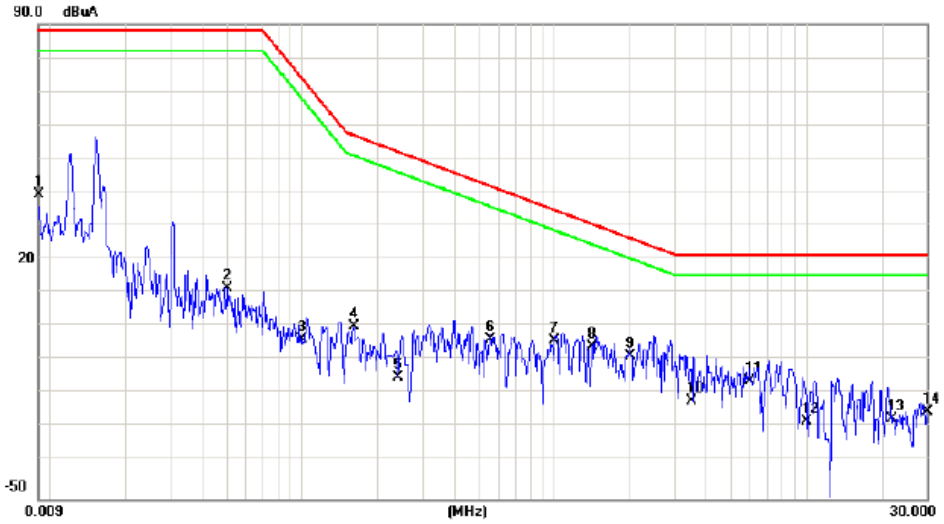
The EUT operated at its rated voltage and its rated frequency. Each sample was put on a wooden table in the loop antenna. The sample was placed in the center of the loop antenna. Each sample was operated for at least 15 min. before a measurement.

Induced current in the loop antenna was measured by means of a current probe (1 V/A) according to clause 9 of EN 55015: 2019+A11. The three-field components were measured in sequence by means of a coaxial switch (loop antenna controller).

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

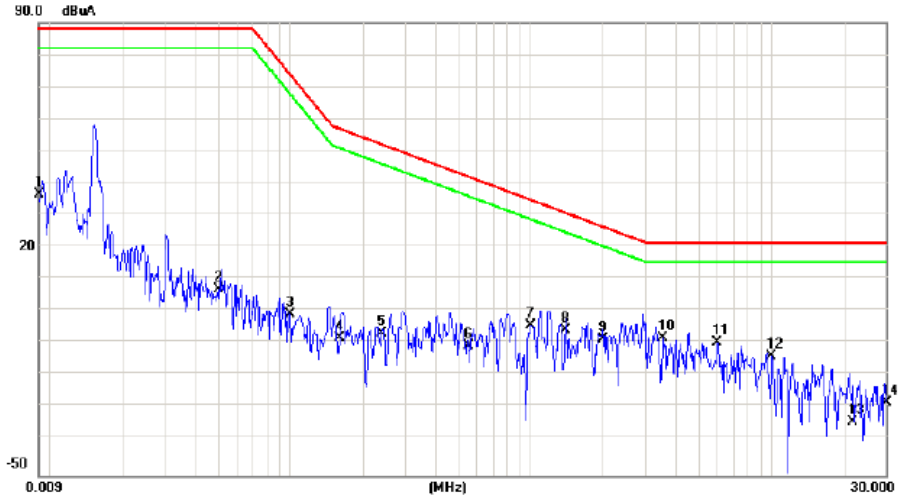
No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuA	dB	dBuA	dBuA	dB	Detector	cm	degree	Comment
1		0.0090	46.97	1.08	48.05	88.00	-39.95	peak			
2		0.0500	8.04	1.08	9.12	88.00	-78.88	peak			
3		0.1000	-5.17	1.08	-4.09	73.96	-78.05	peak			
4		0.1600	-12.78	1.08	-11.70	57.22	-68.92	peak			
5		0.2400	-11.31	1.08	-10.23	52.35	-62.58	peak			
6		0.5500	-22.61	1.18	-21.43	42.39	-63.82	peak			
7		1.0000	-5.15	1.21	-3.94	35.20	-39.14	peak			
8		1.4000	-9.30	1.22	-8.08	31.16	-39.24	peak			
9	*	2.0000	-7.75	1.23	-6.52	26.87	-33.39	peak			
10		3.5000	-16.48	1.22	-15.26	22.00	-37.26	peak			
11		6.0000	-19.73	1.26	-18.47	22.00	-40.47	peak			
12		10.0000	-27.65	1.42	-26.23	22.00	-48.23	peak			

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



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuA	dB	dBuA	dBuA	dB	Detector	cm	degree	Comment
1		0.0090	38.70	1.08	39.78	88.00	-48.22	peak			
2		0.0500	11.02	1.08	12.10	88.00	-75.90	peak			
3		0.1000	-3.89	1.08	-2.81	73.96	-76.77	peak			
4		0.1600	-0.14	1.08	0.94	57.22	-56.28	peak			
5		0.2400	-15.19	1.08	-14.11	52.35	-66.46	peak			
6		0.5500	-3.95	1.18	-2.77	42.39	-45.16	peak			
7		1.0000	-4.55	1.21	-3.34	35.20	-38.54	peak			
8		1.4000	-6.09	1.22	-4.87	31.16	-36.03	peak			
9	*	2.0000	-9.00	1.23	-7.77	26.87	-34.64	peak			
10		3.5000	-22.50	1.22	-21.28	22.00	-43.28	peak			
11		6.0000	-16.32	1.26	-15.06	22.00	-37.06	peak			
12		10.0000	-28.35	1.42	-26.93	22.00	-48.93	peak			

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



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuA	dB	dBuA	dBuA	dB	Detector	cm	degree	Comment
1		0.0090	36.05	1.08	37.13	88.00	-50.87	peak			
2		0.0500	6.60	1.08	7.68	88.00	-80.32	peak			
3		0.1000	-1.09	1.08	-0.01	73.96	-73.97	peak			
4		0.1600	-8.60	1.08	-7.52	57.22	-64.74	peak			
5		0.2400	-7.23	1.08	-6.15	52.35	-58.50	peak			
6		0.5500	-11.21	1.18	-10.03	42.39	-52.42	peak			
7		1.0000	-5.00	1.21	-3.79	35.20	-38.99	peak			
8		1.4000	-6.25	1.22	-5.03	31.16	-36.19	peak			
9		2.0000	-9.20	1.23	-7.97	26.87	-34.84	peak			
10	*	3.5000	-8.52	1.22	-7.30	22.00	-29.30	peak			
11		6.0000	-10.07	1.26	-8.81	22.00	-30.81	peak			
12		10.0000	-14.66	1.42	-13.24	22.00	-35.24	peak			

4.2 Emission in the Frequency Range above 30 MHz

4.2.1 Radiated Electromagnetic Disturbance (30-1000 MHz)

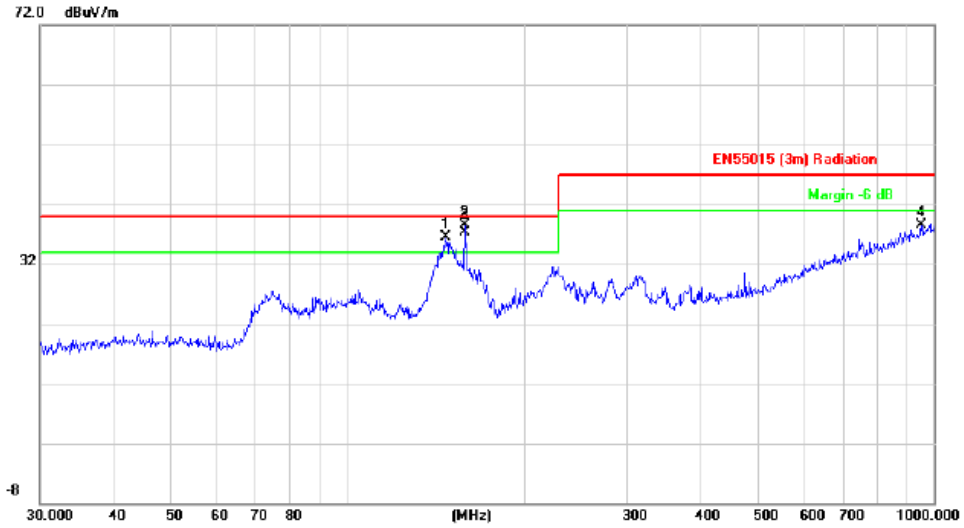
Test procedure	:	EN 55015: 2019+A11, Clause 9.3.4.4; CISPR 16-2-1 CDNE method & Clause 9.3.4.1; CISPR 16-2-3 radiated measurement method
Frequency range	:	30 – 300 MHz (CDN measurement) 30 – 1000 MHz (Semi-anechoic chamber measurement)
Limits	:	EN 55015: 2019+A11, Clause 4.5.3, Table 10
Kind of test site	:	shielded room & Semi-anechoic chamber
Operation modes	:	On mode
Ambient condition	:	Temperature: 23.0-23.1 °C; Relative Humidity: 48.6-48.8 %
Expanded measurement uncertainty (k=2)	:	3.72 dB (CDN measurement) 5.49 dB (Semi-anechoic chamber measurement)
Test result	:	Pass

The measurement setup was made according to EN 55015: 2019+A11 in a shielded room.

The EUT was placed on a wooden support with a height of 10 cm which in turn were placed on an earthed metal plate with dimensions at least 20 cm larger than the EUT.
The EUT was connected via a mains supply cable with a length of 20 cm to the appropriate CDN. The disturbance of the cable to the metal plate was 4 cm. The CDN was mounted on the metal plate.
The RF output of the CDN is connected to a measuring receiver with a quasi-peak detector via a 6 dB, 50 Ω attenuator.
The following figures and tables were those measured by an automatic measurement system. A preview test was firstly performed with peak detector.

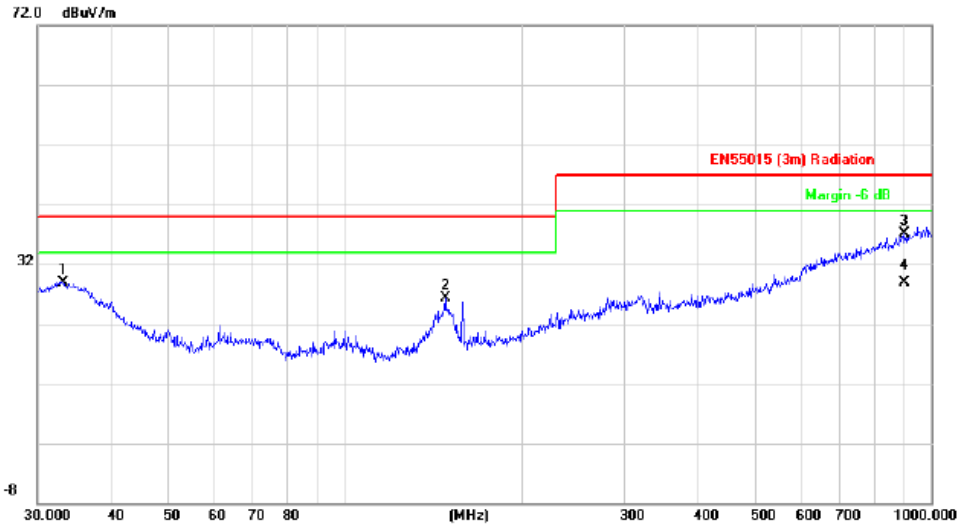
The radiated disturbance test was carried out in a semi-anechoic chamber. The test distance from the receiving antenna to the EUT is 3 m. The normalized site attenuation of the semi-anechoic chamber is regularly calibrated to ensure the radiated disturbance test results are valid. During the test, the EUT was placed on a wooden table, which is 0.8 m high. The wooden table was rotated 360° around and the antenna was varied from 1 m to 4 m to find the maximum disturbance. The test was performed with the antenna both in its horizontal and vertical polarizations.
The following figures and tables were those measured by an automatic measurement system. A preview test was firstly performed with peak detector. The final test was performed with quasi-peak at those critical frequencies during the preview test.

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



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1	!	147.4036	19.22	17.37	36.59	40.00	-3.41	peak	200	6	
2	*	158.6677	19.61	18.95	38.56	40.00	-1.44	peak	200	209	
3	!	158.6877	18.43	18.96	37.39	40.00	-2.61	QP	200	208	
4		952.0937	6.76	31.78	38.54	47.00	-8.46	peak	158	0	

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



No.	Mk.	Freq.	Reading Level	Correct Factor	Measure-ment	Limit	Over		Antenna Height	Table Degree	
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree	Comment
1		33.0950	15.62	13.34	28.96	40.00	-11.04	peak	100	210	
2		148.4410	14.17	12.13	26.30	40.00	-13.70	peak	100	360	
3	*	900.1474	6.02	31.07	37.09	47.00	-9.91	peak	100	200	
4		900.1491	-2.21	31.07	28.86	47.00	-18.14	QP	100	200	

5 Test Results IMMUNITY

During the immunity tests, the EUT was operated under conditions specified by clause 2.1 of this report.

Performance criterion A: During the test no change of the luminous intensity shall be observed and the regulating control, if any, shall operate during the test as intended.

Performance criterion B: During the test the luminous intensity may change to any value. After the test the luminous intensity shall be restored to its initial value within 1 min.
Regulating controls need not function during the test, but after the test the mode of the control shall be the same as before the test provided that during the test no mode changing commands were given.

Performance criterion C: During and after the test any change of the luminous intensity is allowed and the lamp(s) may be extinguished. After the test, within 30 min, all functions shall return to normal if necessary by temporary interruption of the mains supply and/or operating the regulating control.

Room temperature: 23.0-25.5 °C
Relative humidity: 38.6-46.6 %
Test voltage: AC 230 V, 50 Hz
Working mode: On mode

5.1 Enclosure

5.1.1 Electrostatic Discharge

The immunity against electrostatic discharge was tested in accordance with EN 61547:2009. Test setup and ESD-Generator are according to IEC 61000-4-2 which is specified by EN 61547:2009.

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 0.5 m.

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

A horizontal coupling plane (HCP), 1.6 m x 0.8 m, placed on the table and isolate the EUT 0.5mm thick. Vertical coupling plane of dimensions 0.5 m x 0.5 m is placed parallel to and positioned at a distance of 0.1 m from the EUT.

Basic standard	:	IEC 61000-4-2
Test voltage	:	±4.0 kV (Contact discharge), ±2.0 kV, ±4.0 kV, ±8.0 kV (Air discharge)
Polarity	:	positive / negative
Number of discharges	:	≥10
Performance criteria	:	B
Atmospheric pressure	:	102.4 kPa
Test result	:	Pass

Table 2: ESD, Positive / Negative Polarity

Position	Kind of Discharge	Result	Remarks
Enclosure (Non-metal)	Air discharge ±2.0 kV, ±4.0 kV, ±8.0 kV	Pass	No change of luminous intensity
Seam	Air discharge ±2.0 kV, ±4.0 kV, ±8.0 kV	Pass	
Coupling plane (Both VCP & HCP)	Contact discharge ±4.0 kV	Pass	

5.1.2 Radio Frequency Electromagnetic Field

The immunity against radio-frequency electromagnetic fields in the frequency range between 80 MHz and 1000 MHz was tested in accordance to IEC 61000-4-3 which is specified by clause 5.1 in EN 61547:2009.

The test set-up, the RF signal generator, the power amplifier and the antennas were in accordance with IEC 61000-4-3. The test was performed in an anechoic chamber with a test distance of 2.2 m. The field uniformity of the anechoic chamber is regularly calibrated to meet 0-6 dB field uniformity criterion as specified in IEC 61000-4-3.

Basic standard	:	IEC 61000-4-3
Test level	:	3 V/m
Frequency range	:	80-1000 MHz
Modulation	:	80 % AM, 1 kHz
Frequency sweep speed	:	Frequency step: 1 %; Dwell time: 3 s
Performance criteria	:	A
Test result	:	Pass

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

Field polarization	Position	Observation	Remarks
Horizontal polarization	Front side	No change of luminous intensity	Pass
	Rear side		
	Left side		
	Right side		
Vertical polarization	Front side	No change of luminous intensity	Pass
	Rear side		
	Left side		
	Right side		

5.1.3 Power frequency magnetic field

Basic standard	:	IEC 61000-4-8
Test result	:	Pass

According to clause 5.4 of EN 61547:2009, this test needs only to be applied to equipment containing components susceptible to magnetic fields, such as Hall elements or magnetic field sensors. The equipment under test does not have any component susceptible to magnetic fields. Therefore, the equipment under test is deemed to be compliant without practical testing.

5.2 Input and Output AC Power Ports

5.2.1 Fast Transients on AC Power Lines

The immunity against fast transients on AC power lines was tested in accordance to IEC 61000-4-4 which is specified by clause 5.5 in EN 61547:2009.

Test set-up and the fast transient noise generator were according to IEC 61000-4-4 which is specified by 错误!未找到引用源。. The EUT is placed on 0.1 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 0.5 m.

The length between the coupling device and the EUT shall be 0.5 m±0.05 m. The cord length more than 0.5 m±0.05 m, the excess length of the cable shall be folded to avoid a flat coil and situated at a distance of 0.1 m above the ground reference plane.

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

Basic standard	:	IEC 61000-4-4
Test voltage	:	1 kV
Polarity	:	negative/positive
Repetition frequency	:	5 kHz
Test duration	:	≥120 sec
T_r/T_d	:	5 ns/50 ns
Performance criteria	:	B
Test result	:	Pass

Table 4: Burst, AC Power lines, Positive and Negative Polarity

Position	Observation	Result
AC Input port	No change of luminous intensity	Passed

5.2.2 Injected Current into AC Power Port

The immunity against injected current into AC power port was tested according to EN 61547:2009 in a shielded room.

The test set-up and the test generator were according to IEC 61000-4-6 which is specified by EN 61547:2009. The simple luminary was placed on a small wooden support 0.1 m above a reference ground plane which is of an aluminum. The EUT comprised a single unit. The coupling and decoupling networks was 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 height of cable between the EUT and the coupling and decoupling networks above the ground reference plane was 50 mm.

Basic standard	:	IEC 61000-4-6
Voltage level	:	3 V(rms)(unmodulated)
Environmental phenomena	:	r.f. current, common mode, 1 kHz, 80 % AM
Source impedance	:	150 Ω
Frequency range	:	0.15 – 80 MHz
Sweeping rate	:	Frequency step:1 %, dwell time:3 s
Performance criteria	:	A
Test result	:	Pass

Table 5: Injected current, AC Power Port

Port	Observation	Result
AC input port	No change of luminous intensity	Passed

5.2.3 Surges to AC Power Port

The immunity against surges to AC power port was tested in accordance to IEC 61000-4-5 which is specified by clause 5.7 in EN 61547:2009.

The set-up and the Combination Wave Generator (CWG) were according to IEC 61000-4-5. The decoupling network is incorporated in the CWG.

Basic standard	:	IEC 61000-4-5
Test level	:	±0.5 kV (line to line), ±0.5 kV， ±1.0 kV(line to earth)
T_r/T_d	:	1.2/50 μs (open-circuit voltage) 8/20 μs (short-circuit current)
Polarity	:	Positive / Negative
Pulse number	:	5 pulses for each polarity
Coupling phase	:	90°, 270°
Repetition rate	:	1 pulse/60 second
Performance criteria	:	C
Test result	:	Pass

Table 6: Surges to AC power lines, positive/negative

Coupling mode	Result	Remarks
L-N	Pass	No disturbance of function

5.2.4 Voltage dips and interruptions to AC Power Port

The immunity against voltage dips and interruptions to AC power port was tested in accordance to IEC 61000-4-11 which is specified by EN 61547:2009.

Test set-up and test generator were according to IEC 61000-4-11.

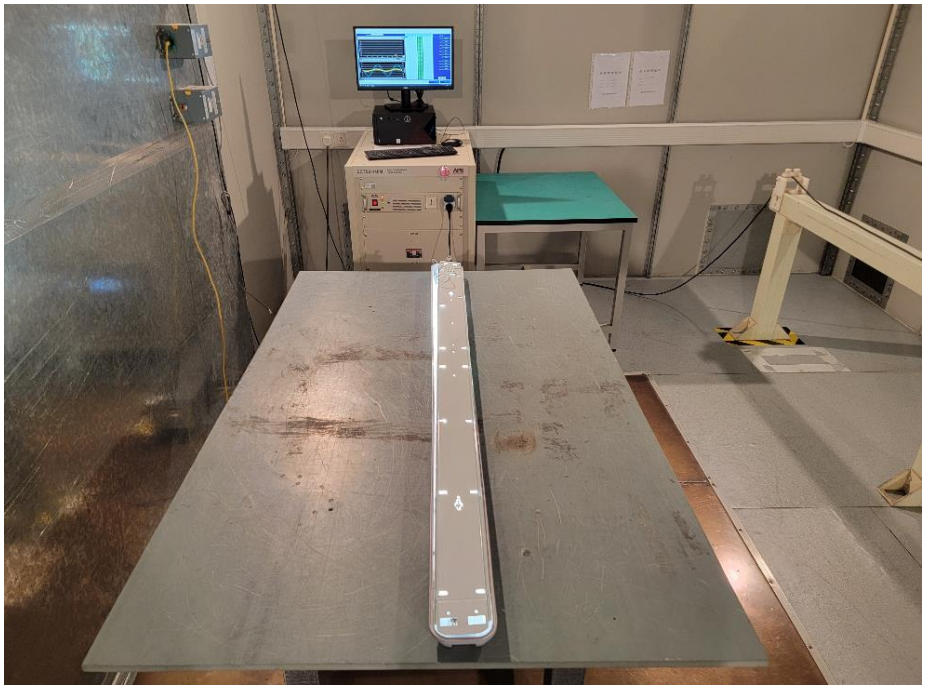
Basic standard	:	IEC 61000-4-11
Test level (in % U_T) and duration (in periods of the rated frequency)	:	0% 0.5 period 70 % 25 periods <5 % 250 periods
Performance criteria	:	B (for test level: 0 %, 0.5 T) C (for other test levels)
Test result	:	Pass

Table 7: Test condition and Test Result for voltage dips and interruptions

Test level (in % U_T)	Duration	Performance criteria	Remarks	Result
0	0.5 T (10 ms)	B	No change of luminous intensity	Pass
70	10 T (200 ms)	C	No change of luminous intensity	Pass

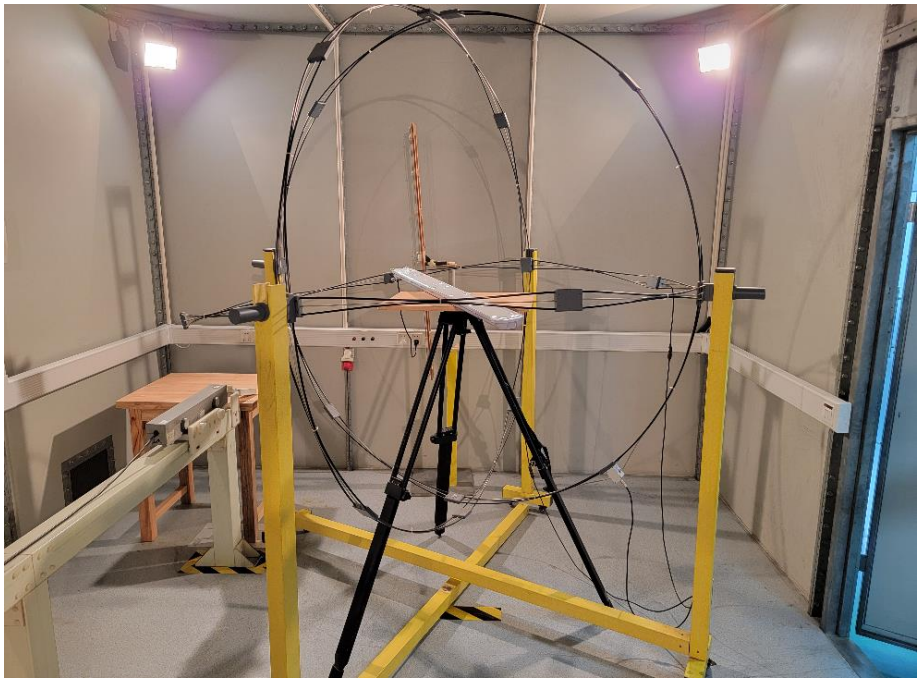
6 Photographs of the Test Set-Up

Photograph 1: Set-up for measurement of harmonics

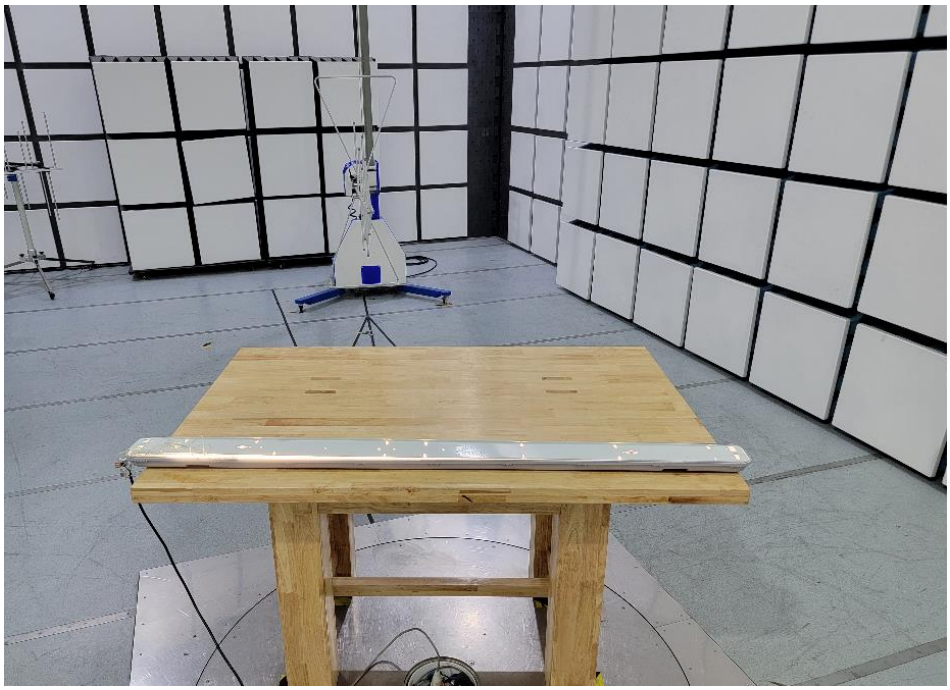


Photograph 2: Set-up for measurement of disturbance voltage

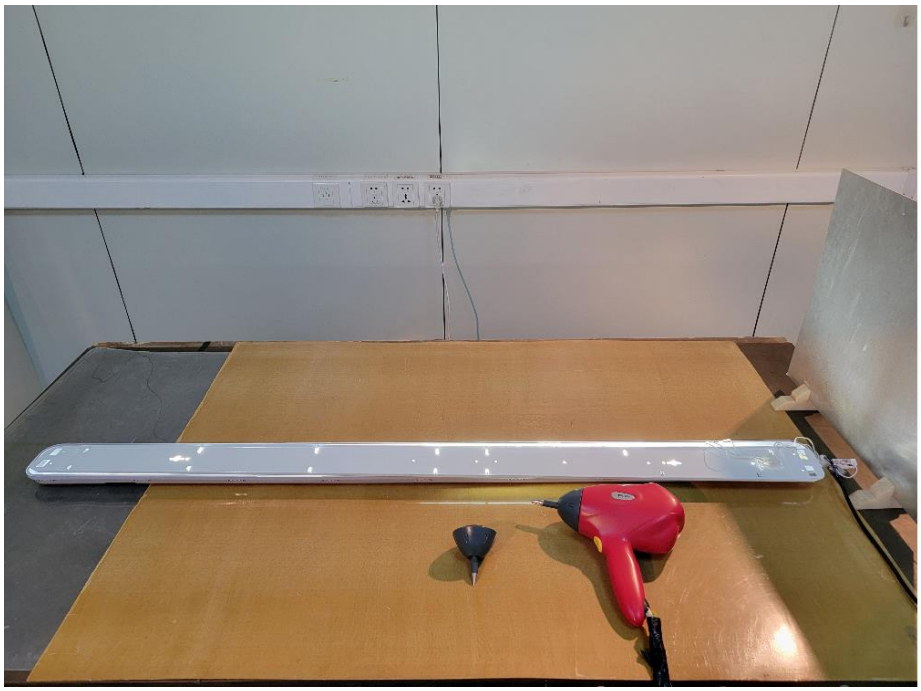
Photograph 3: Set-up for measurement of radiated electromagnetic disturbances (9 kHz-30 MHz)



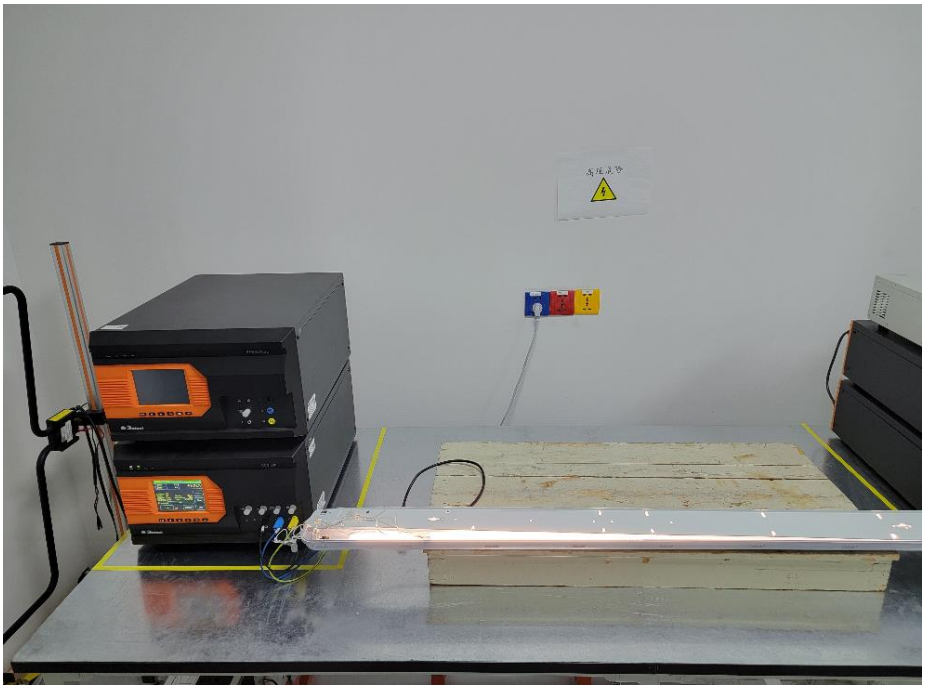
Photograph 4: Set-up for measurement of radiated electromagnetic disturbances (30-1000 MHz)



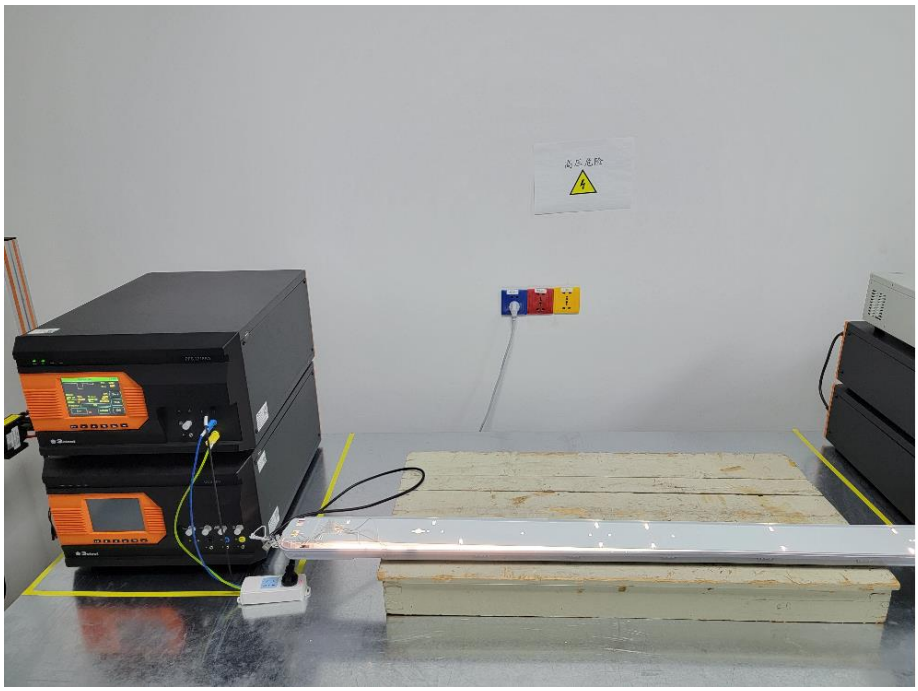
Photograph 5: Set-up for immunity test of ESD



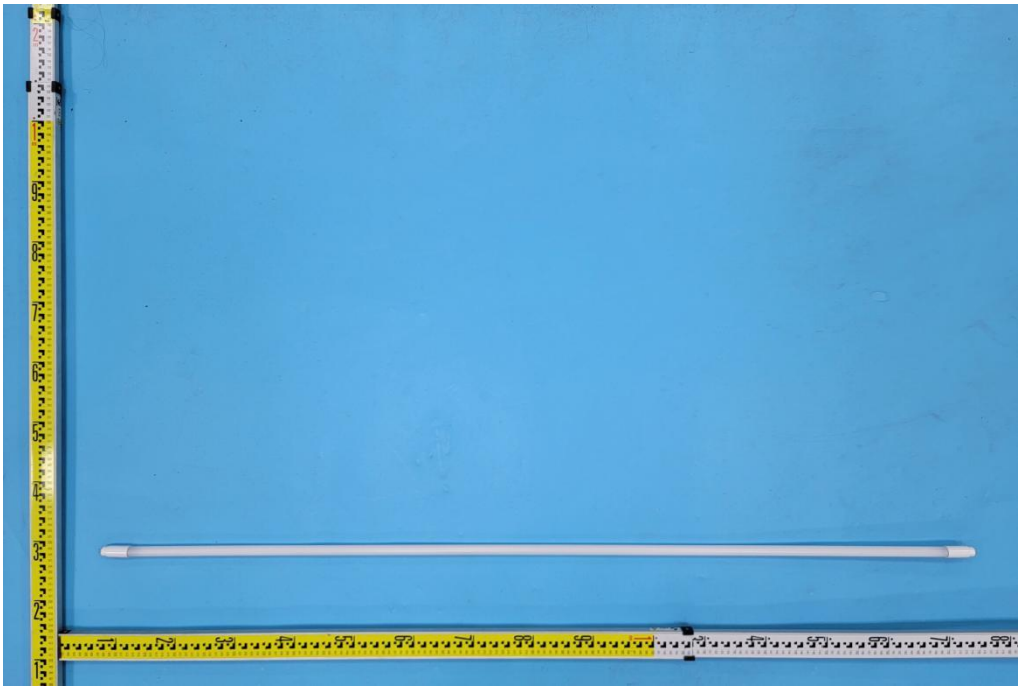
Photograph 6: Set-up for immunity tests of EFT/B and surge



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



Photograph 8: Sample external photos



7 List of Test and Measurement Instruments

No.	Description	Model	Manufacturer	Due Date
1	Harmonics/voltage fluctuation tester	5001ix-CTS-400	California Instruments	28.01.2023
2	5kVA AC power source	5001ix-400	California Instruments	28.01.2023
3	Harmonics/flicker measurement software	CTS 4	California Instruments	NA*
4	EMI test receiver	ESR3	Rohde&Schwarz	11.08.2023
5	Artificial mains network	ENV432	Rohde&Schwarz	04.11.2023
6	Dual display multimeter	F45	Fluke	18.09.2023
7	CDN for emission measurement	CDNE M210	Teseq	03.07.2023
8	Triple loop antenna	HXYZ 9170	Schwarzbeck	11.08.2023
9	ESD generator	NSG 437	Teseq	04.07.2023
10	Barometer	DYM3	Ningbo Jiangshan Glass	02.04.2024
11	Fully anechoic chamber	FAC3plus	Frankonia	25.07.2024
12	Signal generator	SMB100A	Rohde&Schwarz	26.11.2023
13	Power amplifier	NTWPA-00810500	Nanjing Rflight Communication	19.10.2023
14	Average power sensor	NRP6AN	Rohde&Schwarz	04.08.2023
15	Average power sensor	NRP6AN	Rohde&Schwarz	04.08.2023
16	Broadband field meter	NBM-520	Narda	12.07.2023
17	E-field Probe	EF1891	Narda	12.07.2023
18	EMS antenna	HL 046	Rohde&Schwarz	NA*
19	40dB dual-directional coupler	C5982	Werlatone	19.02.2024
20	EMC measurement software	EMC32 (Ver 10.20.01)	Rohde&Schwarz	NA*
21	EMC test system	NSG 3060	Teseq	29.09.2023
22	Coupling/decoupling network	CDN M016	Schaffner	10.11.2023
23	Conducted immunity test system	NSG 4070B-75	Teseq	29.09.2023
24	3-phase voltage dips simulator	CSS-20P3	Shanghai Skylark	29.10.2023

8 List of Tables

9 List of Figures

10 List of Photographs

End of Test Report