

LANGXU SOLAR ELECTRONICS TECHNOLOGY CO., LTD

CE TEST REPORT

SCOPE OF WORK:

EMC directive (2014/30/EU) – EMC report

Model:

See page8

REPORT NUMBER

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Report no. 220901397SHA-001

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No.9 Zi An road, Jiangnan high technical zone, Xiadian community
Changtai Street, Licheng district, Quanzhou, Fujian,China

Manufacturer : LANGXU SOLAR ELECTRONICS TECHNOLOGY CO., LTD
No.9 Zi An road, Jiangnan high technical zone, Xiadian community
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Manufacturing site : LANGXU SOLAR ELECTRONICS TECHNOLOGY CO., LTD
No.9 Zi An road, Jiangnan high technical zone, Xiadian community
Changtai Street, Licheng district, Quanzhou, Fujian,China

Summary

The equipment complies with the requirements according to the following standard(s) or Specification:


EN IEC 55015:2019/+A11:2020 / BS EN IEC 55015:2019/+A11:2020: Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment


EN 61547:2009 / BS EN 61547:2009: Equipment for general lighting purposes - EMC immunity requirements

Result: Pass

PREPARED BY:

REVIEWED BY:


Andy Chen
Project Engineer


Star Guo
Reviewer

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Revision History

Report No.	Version	Description	Issued Date
220901397SHA-001	Rev. 01	Initial issue of report	October 19, 2022

Measurement result summary

TEST ITEM	TEST RESULT	NOTE
Assessment of wired network ports	NA	
Assessment of local wired ports	NA	
Assessment of the enclosure port	Pass	
Electrostatic Discharge (ESD)	Pass	
RF electromagnetic field susceptibility	Pass	
Electric Fast Transient /Burst (EFT/B)	NA	
Surge	NA	
Injected Current	NA	
Voltage dips and interruption	NA	

Notes: 1. NA =Not Applicable

2. Determination of the test conclusion is based on IEC Guide 115 in consideration of measurement uncertainty.

3. Additions, Deviations and Exclusions from Standards: None.

1. GENERAL INFORMATION

1.1 Description of Equipment Under Test (EUT)

- Product name : Solar light
- Type/Model : HSL049-1, HSL049-2, HSL049-3, HML100, BT001, HIA013, HSC001, HX016, HX017, HX011, HIA013-1, HX007A
HSL003, HPL013, FHL001
HSL087(Φ20CM), HSL087(Φ12.5CM), HSC001(Φ18CM), BL022, BL023, BL187, BC017, BL041, BL162
HPL028, BTD051, BTD052, BG001,
SL099
HSL100
- Description of EUT : All models are divided into six PCB versions, each series is just different in appearance.
We tested six PCB versions: BT001, HSL003, HSL087(Φ20CM), HPL028, SL099, HSL100, and listed the worst data in the report.
- Rating : Battery powered
- Brand name : -
- Mains lead : None.
- Data cable : None.
- EUT type : Table-top
 Floor standing
- Sample received date : September 22, 2022
- Sample Identification : 0220918-47
No.
- Date of test : October 08 ~ 11, 2022

1.2 Description of Test Facility

Name : Intertek Testing Services Shanghai

Address : Building 86, No. 1198 Qinzhou Road(North), Shanghai 200233, P.R.
China

Telephone : 86 21 61278200

Telefax : 86 21 54262353

The test facility is : CNAS Accreditation Lab
recognized, certified, Registration No. CNAS L0139
or accredited by these FCC Accredited Lab
organizations Designation Number: CN0175

IC Registration Lab
CAB identifier.: CN0051

VCCI Registration Lab
Registration No.: R-14243, G-10845, C-14723, T-12252

A2LA Accreditation Lab
Certificate Number: 3309.02

2. TEST SPECIFICATIONS

2.1 Normative Standards

CISPR 32:2015: Electromagnetic compatibility of multimedia equipment - Emission Requirements

IEC 61000-4-2:2008: Electromagnetic Compatibility (EMC) – Part 4-2: testing and measurement techniques – electrostatic discharge immunity test

IEC 61000-4-3:2006+A1:2007: Electromagnetic Compatibility (EMC) – Part 4-3: testing and measurement techniques – radiated, radio frequency, electromagnetic field immunity test

IEC 61000-4-4:2004: Electromagnetic Compatibility (EMC) – Part 4-4: testing and measurement techniques – electric fast transient/burst immunity test

IEC 61000-4-5:2005: Electromagnetic Compatibility (EMC) – Part 4-5: testing and measurement techniques – section 5: surge immunity test

IEC 61000-4-6:2008: Electromagnetic Compatibility (EMC) – Part 4-6: testing and measurement techniques – section 6: immunity to conducted disturbance, induced by radio frequency field

IEC 61000-4-8:1993+A1:2000: Electromagnetic compatibility (EMC) — Part 4-8: Testing and measurement techniques —Power frequency magnetic field immunity test.

IEC 61000-4-11:2004: Electromagnetic Compatibility (EMC) – Part 4-11: testing and measurement techniques –voltage dips, short interruption and voltage variations immunity test

Note: there are no magnetic sensitive components included in this EUT and magnetic field immunity test according to EN 61000-4-8 is therefore not required.

2.2 Mode of operation during the test

Within this test report, EUT was tested under all available operation modes and tested under its rating voltage and frequency. Other voltage and frequency is specified if used.

2.3 Test Peripherals used

Item No	Description	Band and Model	S/No
1	-	-	-

2.4 Record of climatic conditions

Test Item	Temperature (°C)	Relative Humidity (%)	Pressure (Kpa)
Assessment of wired network ports	NA	NA	NA
Assessment of local wired ports	NA	NA	NA
Assessment of the enclosure port (Radio frequency magnetic field emission)	25	53	-
Assessment of the enclosure port (Radiated Emission)	24	55	-
Electrostatic Discharge (ESD)	24	54	101
RF electromagnetic field susceptibility	25	53	-
Electric Fast Transient /Burst (EFT/B)	NA	NA	NA
Surge	NA	NA	NA
Injected Current	NA	NA	NA
Voltage dips and interruption	NA	NA	NA

Notes: NA =Not Applicable

2.5 Instrument list

Tri-loop Test					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESR7	EC 6194	2022-12-09
<input checked="" type="checkbox"/>	Tri-loop	Schwarzbeck	HXYZ 9170	EC 3384	2023-01-20
Radiated Emission					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESR	EC6501	2023-09-05
<input checked="" type="checkbox"/>	TRILOG broadband Antenna	Schwarzbeck	VULB9168	EC 6402	2023-01-17
ESD					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	ESD generator	TESEQ	NSG 437	EC 4792-4	2023-03-21
Radiated Immunity					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Power amplifier	AR	250W1000B	EC 5818-2	2023-03-20
<input checked="" type="checkbox"/>	Log-period antenna	AR	AT 1080	EC 3044-7	2023-06-17
<input checked="" type="checkbox"/>	Field meter	AR	FL17000	EC 5818-1	2023-08-02
<input checked="" type="checkbox"/>	Power sensor	Keysight	N1914A	EC 5818-3	2023-03-20
<input checked="" type="checkbox"/>	Signal generator	Agilent	N5181A	EC 6171	2023-08-09
Tet Site					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Shielded room	Zhongyu	-	EC 2838	2023-01-11
<input checked="" type="checkbox"/>	Shielded room	Zhongyu	-	EC 2839	2023-01-11
<input checked="" type="checkbox"/>	Semi-anechoic chamber	Albatross project	-	EC 3048	2023-07-08
<input checked="" type="checkbox"/>	Fully-anechoic chamber	Albatross project	-	EC 3047	2023-07-08
Additional instrument					
Used	Equipment	Manufacturer	Type	Internal no.	Due date
<input checked="" type="checkbox"/>	Thermo-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3783	2023-03-24
<input checked="" type="checkbox"/>	Thermo-Hygrograph	ZJ1-2A	S.M.I.F.	EC 3442	2023-01-03
<input checked="" type="checkbox"/>	Thermo-Hygrograph	ZJ1-2A	S.M.I.F.	EC 5844	2023-03-08
<input checked="" type="checkbox"/>	Pressure meter	YM3	Shanghai Mengde	EC 4620	2023-09-13

2.6 Measurement Uncertainty

Measurement	Frequency	Expanded Uncertainty (k=2) (±)
Conducted emission at mains ports	9kHz ~ 150kHz	3.52 dB
	150kHz ~ 30MHz	3.19 dB
Continuous disturbance voltage at telecom ports	150kHz ~ 30MHz	3.64 dB
Continuous disturbance current at telecom ports	150kHz ~ 30MHz	2.62 dB
Radiated Emissions up to 1 GHz	30MHz ~ 1GHz	4.90 dB
Radiated Emissions above 1 GHz	1GHz ~ 6GHz	5.02 dB
	6GHz ~ 18GHz	5.28 dB
Harmonic current emission	-	3.90%
Voltage fluctuations and flicker	-	10.34%
ESD	-	6.65%
Radiated susceptibility	-	2.38%
EFT test at main terminal	-	11.57%
EFT test at signal/telecom terminal	-	11.62%
Surge test at main terminal	-	11.57%
Injected current test at main terminal	-	1.88 dB
Injected current test at unshielded signal terminal	-	3.41 dB
Voltage dips and interruption	-	6.05%

Emission Test

3. Assessment of wired network ports

Test result: NA

3.1 Limits

3.1.1 Disturbance voltage limits at the electric power supply interface

Frequency range (MHz)	Limits dB(μV) ¹	
	Quasi-peak	Average
0.009 ~ 0.05	110	-
0.05 ~ 0.15	90 ~ 80 ²	-
0.15 ~ 0.5	66 ~ 56 ²	56 ~ 46 ²
0.5 ~ 5.0	56 ³	46 ³
5.0 ~ 30	60	50

Notes:

- At the transition frequency, the lower limit applies.
- The limit decreases linearly with the logarithm of the frequency in the ranges 50 kHz to 150 kHz and 150 kHz to 0,5 MHz.
- For lighting equipment incorporating exclusively electrodeless lamps, the limit in the frequency range of 2,2 MHz to 3,0 MHz is 73 dB(μV) quasi-peak and 63 dB(μV) average.
- If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

3.1.2 Disturbance voltage limits at wired network interfaces other than power supply

Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0.15 ~ 0.5	80 to 74	70 to 64
0.5 ~ 30	74	64

Note:

- The limits decrease linearly with the logarithm of the frequency in the range 0,15 MHz to 0,5 MHz.
- The disturbance voltage limits are derived for use with an artificial asymmetrical network (AAN) which presents a common mode (asymmetric mode) impedance of 150 Ω to the measured interface.
- If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

3.1.3 Disturbance current limits at wired network interfaces other than power supply

Frequency range (MHz)	Limits dB(μ V)	
	Quasi-peak	Average
0.15 ~ 0.5	40 to 30	30 to 20
0.5 ~ 30	30	20

Note:

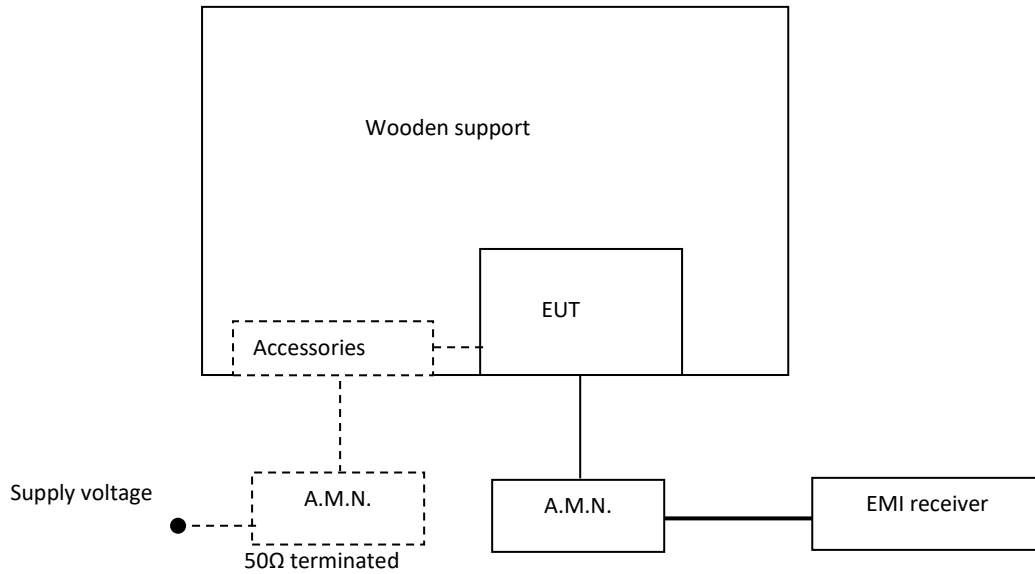
1. The limits decrease linearly with the logarithm of the frequency in the range 0,15 MHz to 0,5 MHz.

2. The disturbance current limits are derived for use of a common mode (asymmetric mode) impedance of 150 Ω . Hence the conversion factor applied is $20 \log(150) = 44 \text{ dB}\Omega$.

3. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

3.2 Block Diagram of Test Setup

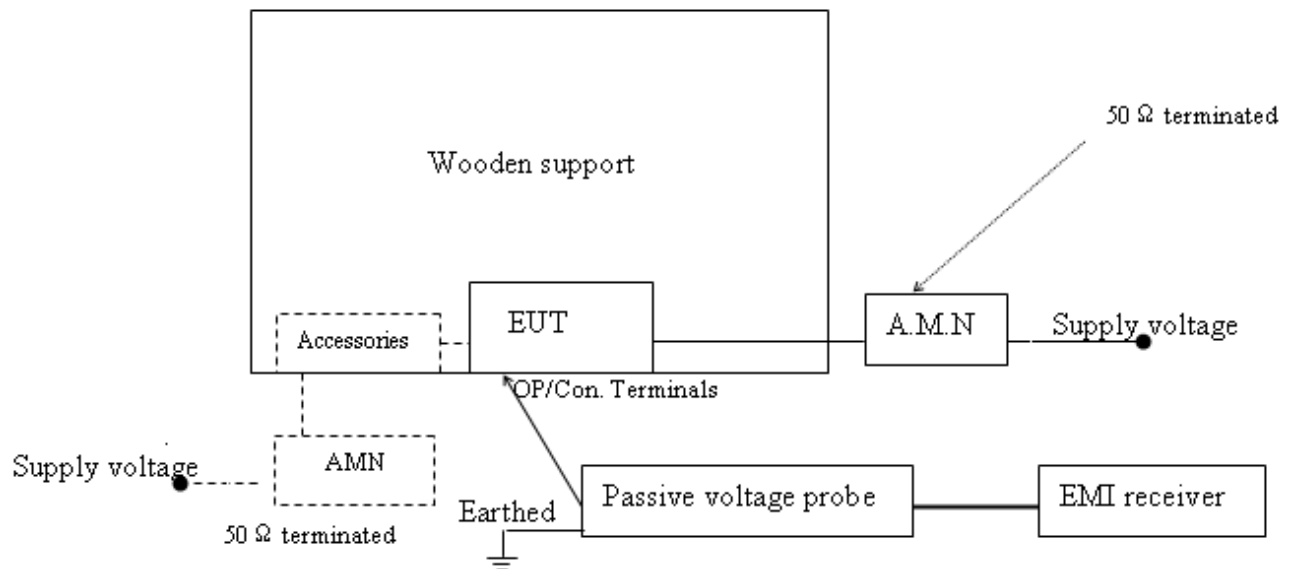
At electric power supply interface



For table top equipment, wooden support is 0.8m height table

For floor standing equipment, wooden support is 0.1m height rack.

At wired network interfaces other than power supply



Note:
 ————— : power line
 ————— : signal line
 - - - - - : means the test setup while available

3.3 Test Setup and Test Procedure

Detailed test procedure and arrangement was following EN IEC 55015 clause 8 & Annex B.
Operation conditions of EUT were according to EN IEC 55015 clause 7 & Annex A.
Measurement was carried out with lamps which have been in operation for:

2 h for incandescent technologies;
100 h for discharge technologies.

Prior to a measurement, the lamps were operated until stabilization has been reached, and the following stabilization time was observed:

15 min for EUTs that do not include gas discharge technologies;
30 min for EUTs that include gas discharge technologies.

The frequency from 9kHz to 30MHz was checked.

The bandwidth of test receiver was set on 200Hz (from 9kHz to 150kHz) and 9kHz (from 150kHz to 30MHz).

3.4 Test Protocol

For electric power supply interface:

L-Line

Frequency (MHz)	Quasi-peak			Average		
	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)
Note: * means the emission level 20dB below the relevant limit.						

N-Line

Frequency (MHz)	Quasi-peak			Average		
	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)
Note: * means the emission level 20dB below the relevant limit.						

- Remark: 1. Correct Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.
 2. Corrected Reading = Original Receiver Reading + Correct Factor
 3. Margin = Limit - Corrected Reading

4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming LISN Factor = 10.00dB, Cable Loss = 2.00dB,
 Original Receiver Reading = 10.00dBuV, Limit = 66.00dBuV.
 Then Correct Factor = 10.00 + 2.00 = 12.00dB;
 Corrected Reading = 10dBuV + 12.00dB = 22.00dBuV;
 Margin = 66.00dBuV – 22.00dBuV = 44.00dB.

For wired network interfaces other than power supply:

- Disturbance voltage
- Disturbance current

Frequency (MHz)	Quasi-peak			Average		
	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)
Note: * means the emission level 20dB below the relevant limit.						

- Remark:
1. Correct Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.
 2. Corrected Reading = Original Receiver Reading + Correct Factor
 3. Margin = Limit - Corrected Reading
 4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming LISN Factor = 10.00dB, Cable Loss = 2.00dB,
 Original Receiver Reading = 10.00dBuV, Limit = 66.00dBuV.
 Then Correct Factor = 10.00 + 2.00 = 12.00dB;
 Corrected Reading = 10dBuV + 12.00dB = 22.00dBuV;
 Margin = 66.00dBuV – 22.00dBuV = 44.00dB.

4. Assessment of local wired ports

Test result: NA

4.1 Limits

4.1.1 Disturbance voltage limits of local wired ports: electrical power supply interface of non-restricted ELV lamps

Frequency range (MHz)	Limits dB(μV) ¹³⁴	
	Quasi-peak	Average
0.009 ~ 0.05	136	-
0.05 ~ 0.15	116 ~ 106 ²	-
0.15 ~ 0.5	92 ~ 82 ²	82 ~ 72 ²
0.5 ~ 5.0	82	72
5.0 ~ 30	86	76

Notes:

- At the transition frequency, the lower limit applies.
- The limit decreases linearly with the logarithm of the frequency in the ranges 50 kHz to 150 kHz and 150 kHz to 0,5 MHz.
- The limits in this table apply if no 26 dB attenuator is applied.
- Disturbance voltage limits for restricted ELV lamps are given in 3.1.1.
- If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

4.1.2 Disturbance voltage limits at local wired ports: local wired ports other than electrical power supply interface of ELV lamp

Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0.15 ~ 0.5	80	70
0.5 ~ 30	74	64

Note:

- At the transition frequency, the lower limit applies.
- If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

4.1.3 Disturbance current limits at local wired ports: local wired ports other than electrical power supply interface of ELV lamp

Frequency range (MHz)	Limits dB(μV)	
	Quasi-peak	Average
0.15 ~ 0.5	40 to 30	30 to 20
0.5 ~ 30	30	20

Note:

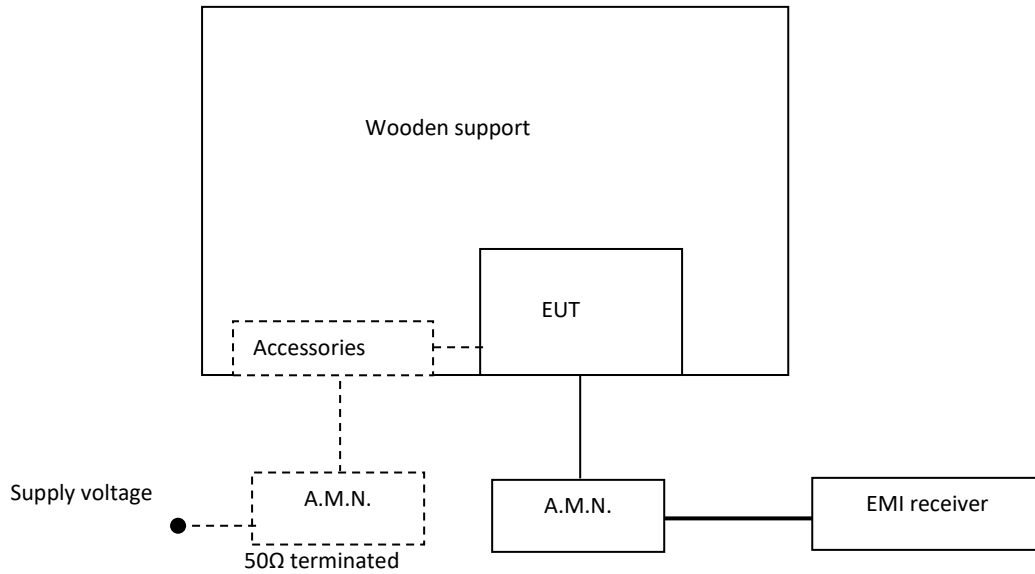
1. The limits decrease linearly with the logarithm of the frequency in the range 0,15 MHz to 0,5 MHz.

2. The disturbance current limits are derived for use of a common mode (asymmetric mode) impedance of 150 Ω. Hence the conversion factor applied is 20 log(150) = 44 dBΩ.

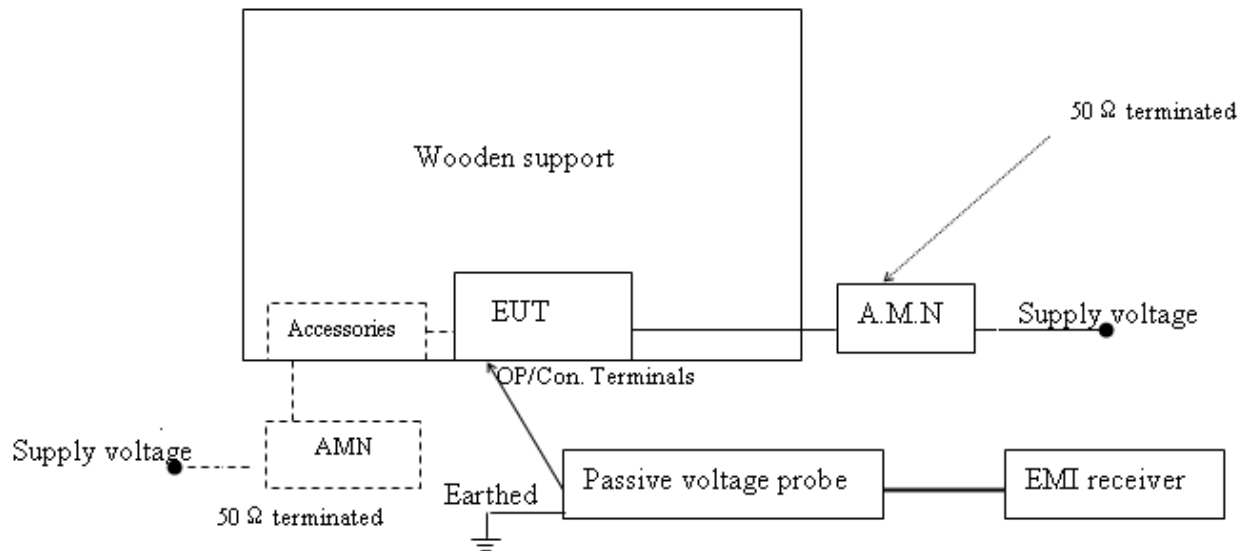
3. If the limit for the measurement with the average detector is met when using a receiver with a quasi-peak detector, the equipment under test shall be deemed to meet both limits and the measurement using the receiver with an average detector need not be carried out.

4.2 Block Diagram of Test Setup

- At electric power supply interface of non-restricted ELV lamps



- For table top equipment, wooden support is 0.8m height table
- For floor standing equipment, wooden support is 0.1m height rack.
- At wired network interfaces other than electrical power supply of ELV lamp



Note:
 ————— : power line
 ————— : signal line
 - - - - - : means the test setup while available

4.3 Test Setup and Test Procedure

Detailed test procedure and arrangement was following EN IEC 55015 clause 8 & Annex B.
Operation conditions of EUT were according to EN IEC 55015 clause 7 & Annex A.
Measurement was carried out with lamps which have been in operation for:

2 h for incandescent technologies;
100 h for discharge technologies.

Prior to a measurement, the lamps were operated until stabilization has been reached, and the following stabilization time was observed:

15 min for EUTs that do not include gas discharge technologies;
30 min for EUTs that include gas discharge technologies.

The frequency from 9kHz to 30MHz was checked.

The bandwidth of test receiver was set on 200Hz (from 9kHz to 150kHz) and 9kHz (from 150kHz to 30MHz).

4.4 Test Protocol

For electrical power supply interface of non-restricted ELV lamps:

L-Line

Frequency (MHz)	Quasi-peak			Average		
	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)
Note: * means the emission level 20dB below the relevant limit.						

N-Line

Frequency (MHz)	Quasi-peak			Average		
	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)
Note: * means the emission level 20dB below the relevant limit.						

- Remark: 1. Correct Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.
 2. Corrected Reading = Original Receiver Reading + Correct Factor
 3. Margin = Limit - Corrected Reading

4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming LISN Factor = 10.00dB, Cable Loss = 2.00dB,
Original Receiver Reading = 10.00dBuV, Limit = 66.00dBuV.
Then Correct Factor = 10.00 + 2.00 = 12.00dB;
Corrected Reading = 10dBuV + 12.00dB = 22.00dBuV;
Margin = 66.00dBuV – 22.00dBuV = 44.00dB.

For local wired ports other than electrical power supply interface of ELV lamp:

- Disturbance voltage
 Disturbance current

Frequency (MHz)	Quasi-peak			Average		
	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)	Corrected Reading (dBuV)	Limit (dBuV)	Margin (dB)
Note: * means the emission level 20dB below the relevant limit.						

- Remark: 1. Correct Factor = LISN Factor + Cable Loss, the value was added to Original Receiver Reading by the software automatically.
2. Corrected Reading = Original Receiver Reading + Correct Factor
3. Margin = Limit - Corrected Reading
4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming LISN Factor = 10.00dB, Cable Loss = 2.00dB,
Original Receiver Reading = 10.00dBuV, Limit = 66.00dBuV.
Then Correct Factor = 10.00 + 2.00 = 12.00dB;
Corrected Reading = 10dBuV + 12.00dB = 22.00dBuV;
Margin = 66.00dBuV – 22.00dBuV = 44.00dB.

5. Assessment of the enclosure port (Frequency range 9 kHz to 30 MHz)

Test result: **PASS**

5.1 Limits

LLAS radiated disturbance limits in the frequency range 9 kHz to 30 MHz

Frequency Range	Quasi-peak limits for three loop diameters dB(μA)		
	2m	3m	4m
9kHz ~ 70kHz	88	81	75
70kHz ~ 150kHz	88 ~ 58 ¹	81 ~ 51 ¹	75 ~ 45 ¹
150kHz ~ 3.0MHz	58 ~ 22 ¹²	51 ~ 15 ¹²	45 ~ 9 ¹²
3.0MHz ~ 30MHz	22	15 ~ 16 ³	9 ~ 12 ³

Notes:

1. Decreasing linearly with the logarithm of the frequency.
2. For lighting equipment incorporating exclusively electrodeless lamps, the limit in the frequency range of 2,2 MHz to 3,0 MHz is 58 dB(μA) for 2 m, 51 dB(μA) for 3 m and 45 dB(μA) for 4 m loop diameter.
3. Increasing linearly with the logarithm of the frequency.

Maximum EUT dimension that can be used for testing using LLAS with different diameters

Maximum dimension of the EUT, D m	Loop antenna diameter m
$D \leq 1,6$	2
$D \leq 2,6$	3
$D \leq 3,6$	4

Loop antenna radiated disturbance limits in the frequency range 9 kHz to 30 MHz for equipment with a dimension > 1,6 m

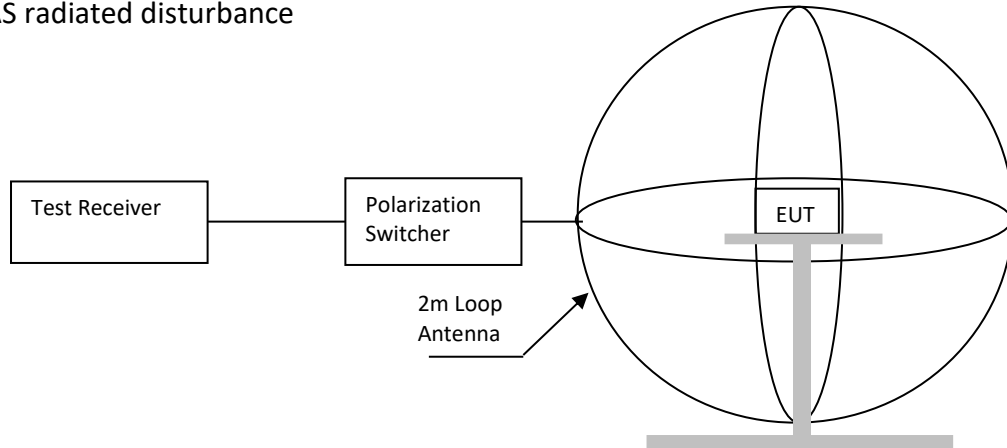
Frequency range MHz	Limits at 3 m distance Quasi-peak dB(μA/m)
0,009 to 0,070	69
0,070 to 0,150	69 to 39 ²
0,150 to 4,0	39 to 3 ¹²
4,0 to 30	3

Notes:

1. For lighting equipment incorporating exclusively electrodeless lamps, the limit in the frequency range of 2,2 MHz to 3,0 MHz is 39 dB(μA/m).
2. Decreasing linearly with logarithm of frequency.

5.2 Block Diagram of Test Setup

LLAS radiated disturbance

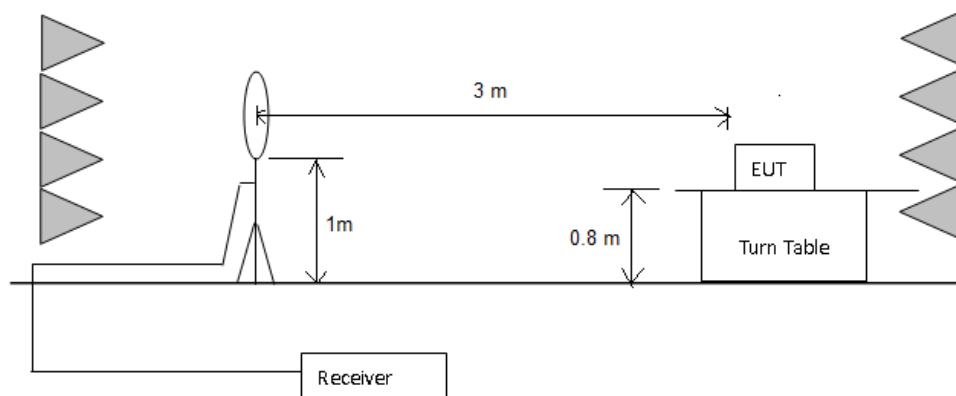


Measurement was performed in shielded room, and instruments used were following EN IEC 55015 clause 9.

Detailed test procedure and arrangement was following EN IEC 55015 clause 9 & Annex C.

Frequency range 9kHz – 30MHz was checked and EMI receiver measurement bandwidth was set to 200Hz (from 9kHz to 150kHz) and 9kHz (from 150kHz to 30MHz).

Loop antenna radiated disturbance



The measurement was applied in a semi-anechoic chamber.

Measurement was performed according to CISPR 32 Annex C.

Setting of EUT is according to EN IEC 55015 clause 9 & Annex C.

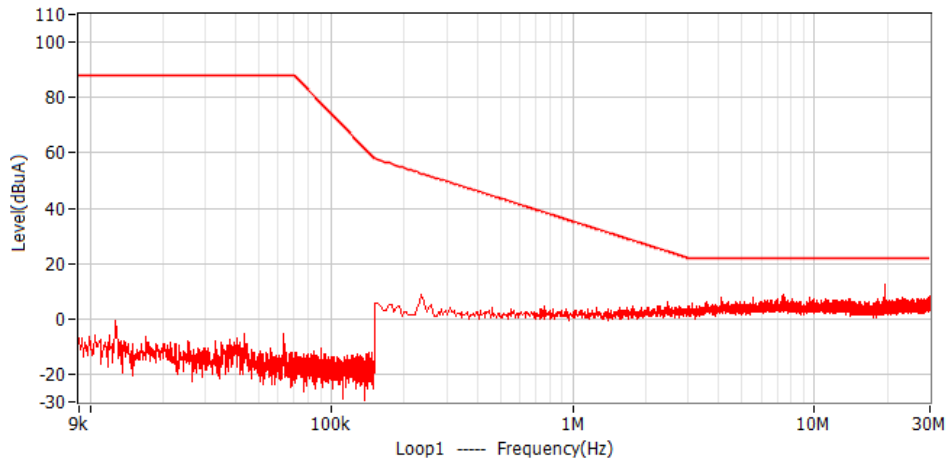
Frequency range 9kHz – 30MHz was checked and EMI receiver measurement bandwidth was set to 200Hz (from 9kHz to 150kHz) and 9kHz (from 150kHz to 30MHz).

5.3 Test Protocol

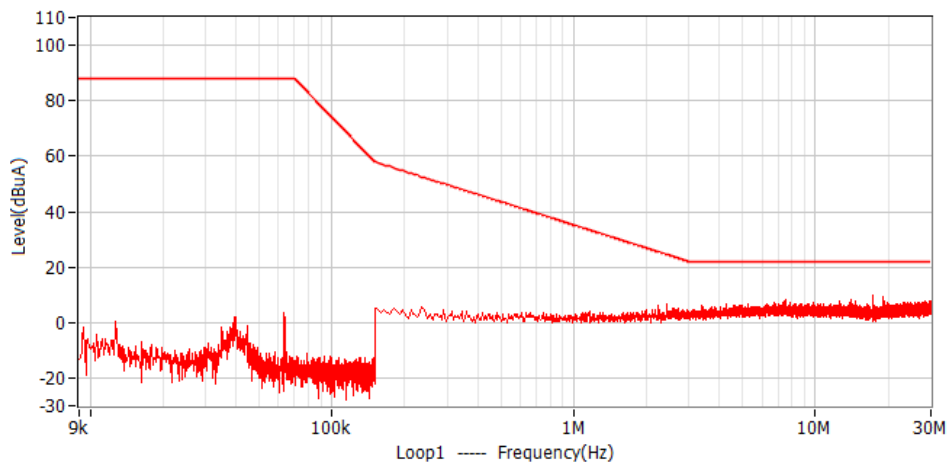
LLAS radiated disturbance (EN IEC 55015 clause 9.3.2)

Loop antenna radiated disturbance (EN IEC 55015 clause 9.3.3)

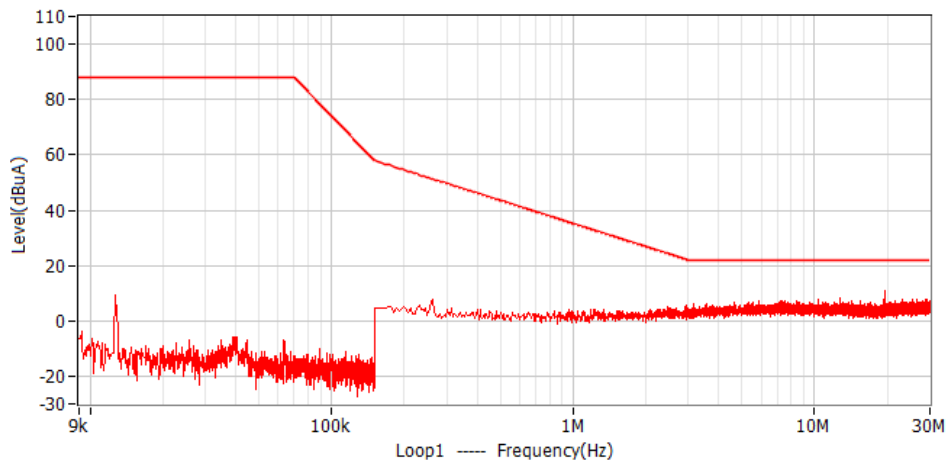
X direction



Y direction



Z direction



Frequency /MHz	Quasi-peak (dB μ A)			Permitted limit
	Disturbance level			
	X direction	Y direction	Z direction	
0.009	*	*	*	88.00
0.05	*	*	*	88.00
0.10	*	*	*	73.96
0.24	*	*	*	52.40
0.55	*	*	*	42.52
1.00	*	*	*	35.39
1.40	*	*	*	31.39
2.00	*	*	*	27.14
3.50	*	*	*	22.00
6.00	*	*	*	22.00
10.00	*	*	*	22.00
22.00	*	*	*	22.00
30.00	*	*	*	22.00

Notes: * means the radiated electromagnetic disturbance level 20dB lower than the relevant limit.

6. Assessment of the enclosure port (Frequency range 30 MHz to 1GHz)

Test result: **PASS**

6.1 Limit

SAC method limits from frequency range 30MHz – 1000MHz

Frequency (MHz)	Permitted limit in dB μ V/m (Quasi-peak) of Measurement Distance 3m	Permitted limit in dB μ V/m (Quasi-peak) of Measurement Distance 10m
30 ~ 230	40	30
230 ~ 1000	47	37

Notes:

- At the transition frequency, the lower limit applies.
- The gray rows are selected items.

CDNE method limits 30MHz – 300MHz

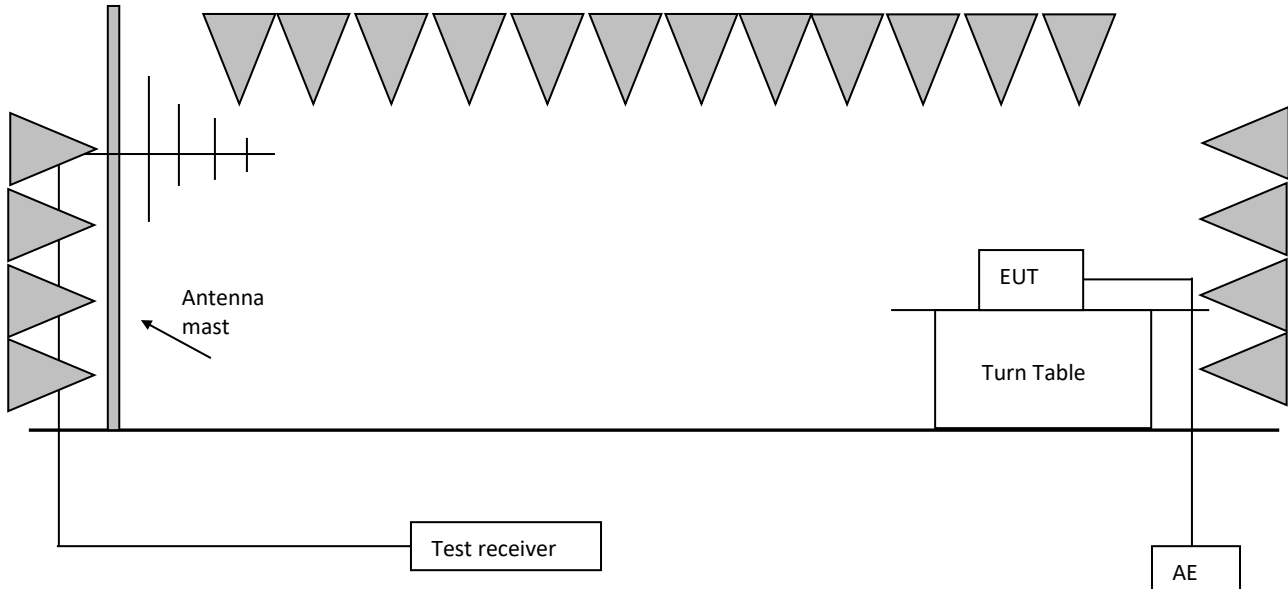
Frequency (MHz)	Quasi-peak limits dB(μ V)
30 ~ 100	64 ~ 45 ²
100 ~ 200	54
200 ~ 300	54 to 51 ²

Notes:

- At the transition frequency, the lower limit applies.
- The limit decreases linearly with the logarithm of the frequency.
- The CDNE method and the associated limits up to 300 MHz can be only applied for EUTs with clock frequencies below or equal to 30 MHz. In such a case, the product is deemed to comply with the requirements between 300 MHz and 1 000 MHz. If the CDNE test fails, then any of the other methods and associated limits can still be applied.
- The EUT size limitation of CISPR 16-2-1 does not apply. For the CDNE method, the largest dimensions of the EUT are 3 m x 1 m x 1 m (l x w x h). The CDNE restrictions apply to the EUT only, and not the wiring or the total dimension of the system under test.

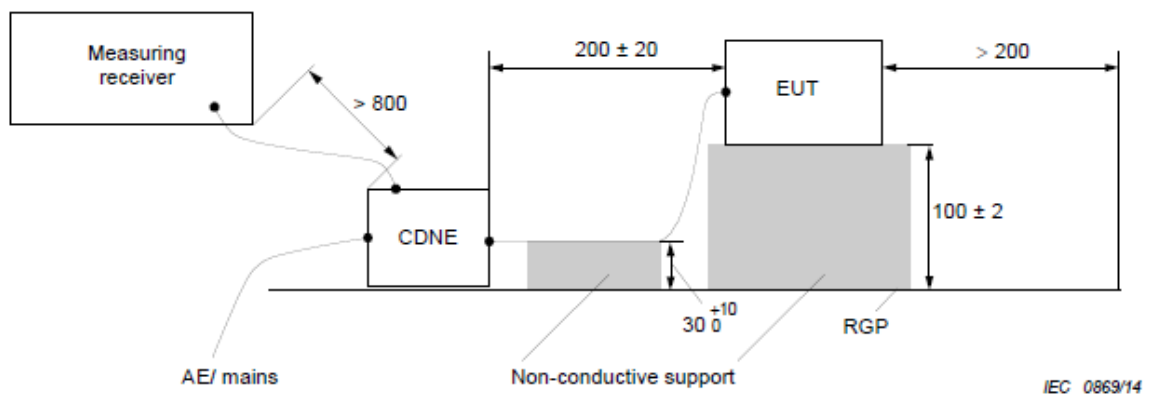
6.2 Block diagram and test set up

For SAC method



The measurement was applied in a semi-anechoic chamber.
Measurement was performed according to CISPR 32 Annex C.
Setting of EUT is according to EN IEC 55015 clause 9 & Annex C.
The bandwidth setting on test receiver was 120kHz.
The frequency range from 30MHz to 1000MHz was checked.

For CDNE method



"AE/mains" may include AC mains, DC supply as well as control/communication lines.

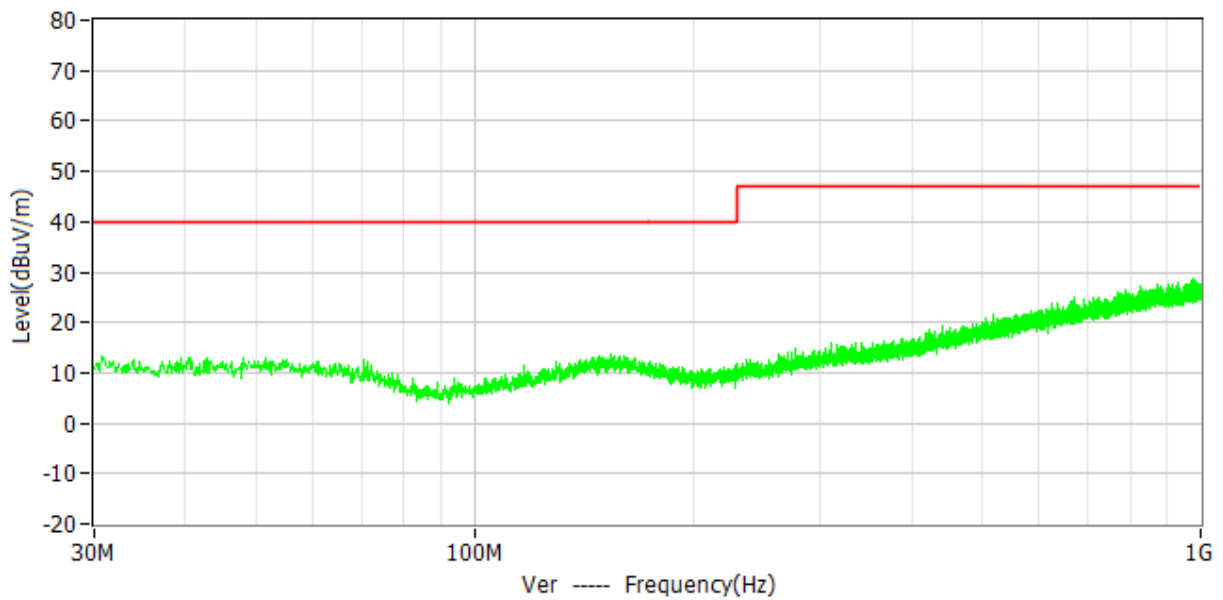
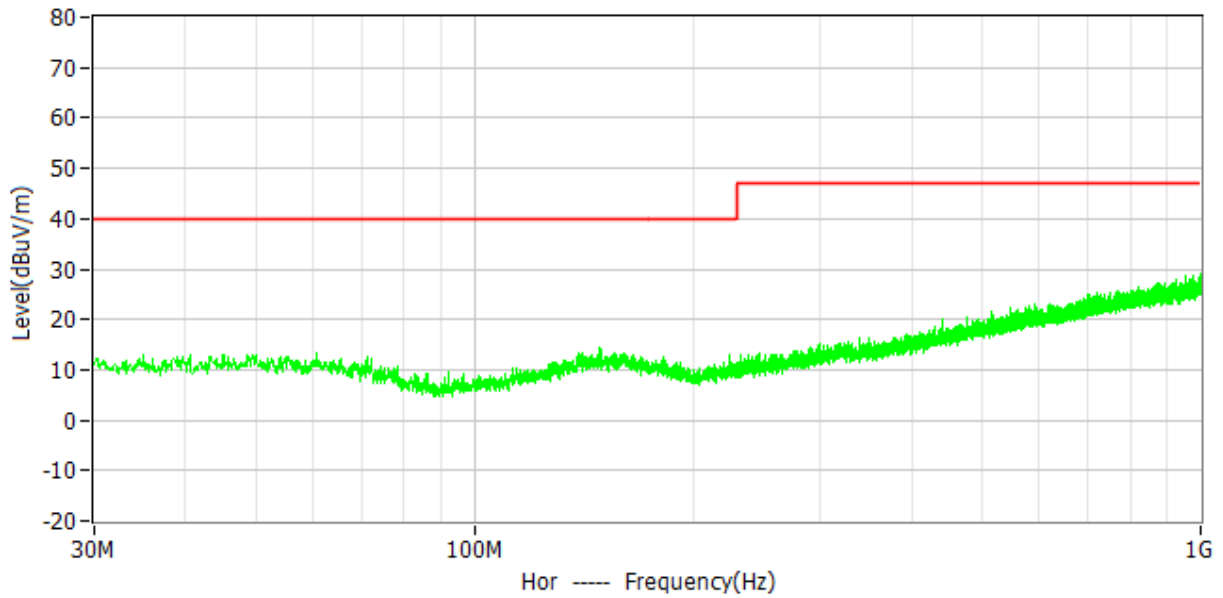
NOTE All dimensions are in mm.

Measurement and setting of EUT were performed according to EN IEC 55015 clause 9 & Annex C.
The frequency range from 30MHz to 300MHz was checked.

6.3 Test Protocol

Test is performed while employing:

- SAC method (EN IEC 55015 clause 9.3.4.1)
- CDNE method (EN IEC 55015 clause 9.3.4.4)



Polarization	Frequency (MHz)	Corrected Reading (dBuV/m)	Corrected Factor (dB/m)	Limits (dBuV/m)	Margin (dBuV/m)
Horizontal	30.00	*	-	40.0	*
	60.00	*	-	40.0	*
	100.00	*	-	40.0	*
	200.00	*	-	40.0	*
	300.00	*	-	47.0	*
	500.00	*	-	47.0	*
	1000.00	*	-	47.0	*
Vertical	30.00	*	-	40.0	*
	60.00	*	-	40.0	*
	100.00	*	-	40.0	*
	200.00	*	-	40.0	*
	300.00	*	-	47.0	*
	500.00	*	-	47.0	*
	1000.00	*	-	47.0	*

Note: * means the emission level 10dB lower than the relevant limit.

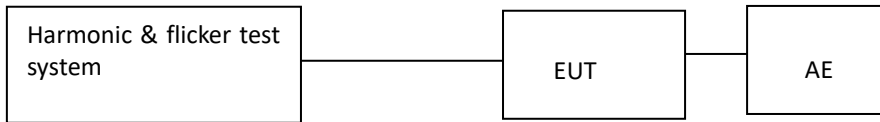
- Remark: 1. Correct Factor = Antenna Factor + Cable Loss (+ Amplifier, for higher than 1GHz), the value was added to Original Receiver Reading by the software automatically.
 2. Corrected Reading = Original Receiver Reading + Correct Factor
 3. Margin = Limit - Corrected Reading
 4. If the PK Corrected Reading is lower than AV limit, the AV test can be elided.

Example: Assuming Antenna Factor = 30.20dB/m, Cable Loss = 2.00dB,
 Gain of Preamplifier = 32.00dB, Original Receiver Reading = 10.00dBuV,
 Limit = 40.00dBuV/m.
 Then Correct Factor = 30.20 + 2.00 – 32.00 = 0.20dB/m;
 Corrected Reading = 10dBuV + 0.20dB/m = 10.20dBuV/m;
 Margin = 40.00dBuV/m - 10.20dBuV/m = 29.80dB.

7. Harmonics

Test result: NA

7.1 Block Diagram of Test Setup



7.2 Test Setup and Test Procedure

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. The measurements were carried out under steady conditions.

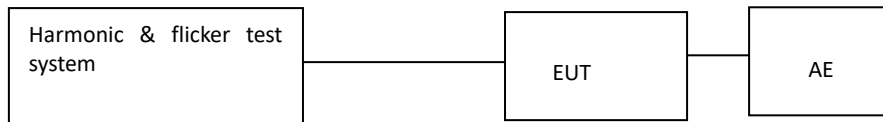
7.3 Test Protocol

- The EUT is lighting equipment with a rated power less than but not equal to 5 W. Therefore, no limits are defined according to EN IEC 61000-3-2 on the EUT.
- Rated power ≥ 5 W and ≤ 25 W
- Rated power > 25 W

8. Voltage Fluctuations-Flicker

Test result: NA

8.1 Block Diagram of Test Setup



8.2 Test Setup and Test Procedure

8.2.1 Definition

Flicker: impression of unsteadiness of visual sensation induced by a light stimulus whose luminance or spectral distribution fluctuates with time.

Pst: Short-term flicker severity.

Plt: long-term flicker severity.

dc: maximum steady state voltage change during an observation period.

dmax: maximum absolute voltage change during an observation period.

d(t): time function of the relative r.m.s. voltage change evaluated as a single value for each successive half period between zero-crossings of the source voltage, except during time interval in which the voltage is a steady-state condition for at least 1s.

8.2.2 Test condition

The EUT was set to produce the most unfavorable sequence of voltage changes.

8.3 Test Protocol

The tested object operated under the operating condition specified in EN 61000-3-3
The following limits apply

- the value of Pst shall not be greater than 1,0.
- the value of Plt shall not be greater than 0,65.
- T_{max}, the accumulated time value of d(t) with a deviation exceeding 3,3 % during a single voltage change at the EUT terminals, shall not exceed 500 ms.
- the maximum relative steady-state voltage change, dc, shall not exceed 3,3 %.
- the maximum relative voltage change d_{max}, shall not exceed:
 - 4% without additional conditions.
 - 6 % for equipment which is:
 - switched manually, or
 - switched automatically more frequently than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds), or manual restart, after a power supply interruption.
 - 7 % for equipment which is:
 - attended whilst in use (for example: hair dryers, vacuum cleaners, kitchen equipment such as mixers, garden equipment such as lawn mowers, portable tools such as electric drills), or
 - switched on automatically, or is intended to be switched on manually, no more than twice per day, and also has either a delayed restart (the delay being not less than a few tens of seconds) or manual restart, after a power supply interruption.
 - for manual switch, d_{max} is measured in accordance with Annex B of standard, average d_{max} is calculated from 24 times measurement.
 - No Limits shall apply to individual lamps.
 - Incandescent lamp luminaries with ratings less than or equal to 1000W and LED lamp luminaires with ratings less than or equal to 600W, are deemed to comply with the d_c, d_{max} and T_{max} limits in the standard EN 61000-3-3 and are not required to be tested.
 - Ballasts are deemed to be part of luminaries and are not required to be tested.

Immunity Test

Performance criteria

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

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.

Additional requirement for lighting equipment incorporating a starting device: After the test, the lighting equipment is switched off. After half an hour it is switched on again. The lighting equipment shall start and operate as intended.

9. Electrostatic Discharge (ESD)

Test result: **PASS**

9.1 Severity Level and Performance Criterion

9.1.1 Test level

1a – Contact discharge		1b – Air discharge	
Level	Test voltage kV	Level	Test voltage kV
1	2	1	2
2	4	2	4
3	6	3	8
4	8	4	15
X	Special	X	Special

Notes:

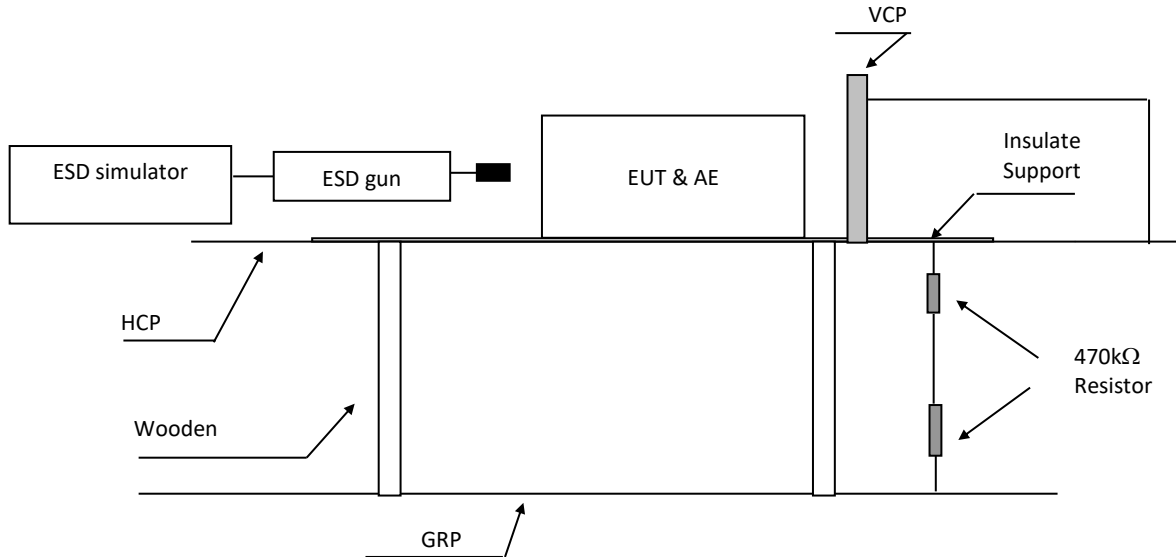
1. "X" is an open level. The level has to be specified in the dedicated equipment specification. If higher voltages than those shown are specified, special test equipment may be needed.
2. The gray rows were the selected test level.

9.1.2 Performance Criterion

Performance criterion: **B** (For emergency luminaires designed to operate in high-risk task areas, after the test, the luminous intensity shall be restored to its initial value within 0.5s.)

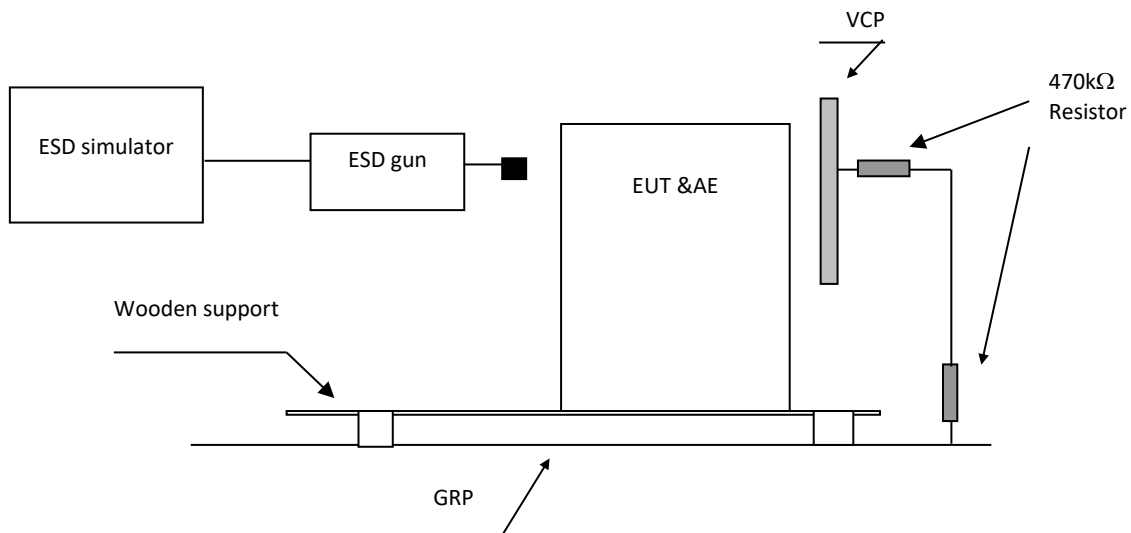
9.2 Block Diagram of Test Setup

For table-top equipment



Note: HCP means Horizontal Coupling Plane
 VCP means Vertical Coupling Plane
 GRP means Ground Reference Plane
 Wooden support is a 0.8m height table

For floor standing equipment



Note: VCP means Vertical Coupling Plane
 GRP means Ground Reference Plane
 Wooden support is a 0.1m height rack

9.3 Test Setup and Test Procedure

Measurement was performed in shielded room.

Measurement and setting of EUT was applied according to IEC 61000-4-2 Clause 7.

The test method and equipment was specified by IEC 61000-4-2 with the modifications by EN 61547 clause 5.2.

9.4 Test Protocol

Direct discharges were applied at the following selected points:

Test point #	Test level [kV]	Air/Contact	Polarity (+/-)	Pass/Fail/NA	Comment
A	2/4	Contact	+/-	Pass	All touchable screws of enclosure
B	2/4	Contact	+/-	Pass	Accessible metal parts of the EUT
C	2/4/8	Air	+/-	Pass	Air gap of the switch, button
D	2/4/8	Air	+/-	Pass	The air in-taking opening
E	2/4/8	Air	+/-	Pass	Slots around the EUT

Indirect contact discharges were applied to the VCP and the HCP at the following selected points:

For table top equipment

Point	Description	Point	Pass/Fail/NA
HCP f	0,1m from the front of the EUT	Edge of centre, corner on HCP	Pass
HCP b	0,1m from the back of the EUT	Edge of centre, corner on HCP	Pass
HCP r	0,1m from the right side of the EUT	Edge of centre, corner on HCP	Pass
HCP l	0,1m from the left side of the EUT	Edge of centre, corner on HCP	Pass
VCP f	0,1m from the front of the EUT	Edge of centre, corner on VCP	Pass
VCP b	0,1m from the back of the EUT	Edge of centre, corner on VCP	Pass
VCP r	0,1m from the right of the EUT	Edge of centre, corner on VCP	Pass
VCP l	0,1m from the left of the EUT	Edge of centre, corner on VCP	Pass

For floor standing equipment

Point	Description	Point	Pass/Fail/NA
VCP f	0,1m from the front of the EUT	Edge of centre, corner on VCP	-
VCP b	0,1m from the back of the EUT	Edge of centre, corner on VCP	-
VCP r	0,1m from the right of the EUT	Edge of centre, corner on VCP	-
VCP l	0,1m from the left of the EUT	Edge of centre, corner on VCP	-

Observation: All the functions were operated as normal during and after test, and there is no change in brightness.

Conclusion: The EUT met the requirements of Performance Criterion B.

10. Electromagnetic field susceptibility

Test result: **PASS**

10.1 Severity Level and Performance Criterion

10.1.1 Test level

Level	Test field strength V/m
1	1
2	3
3	10
X	Special

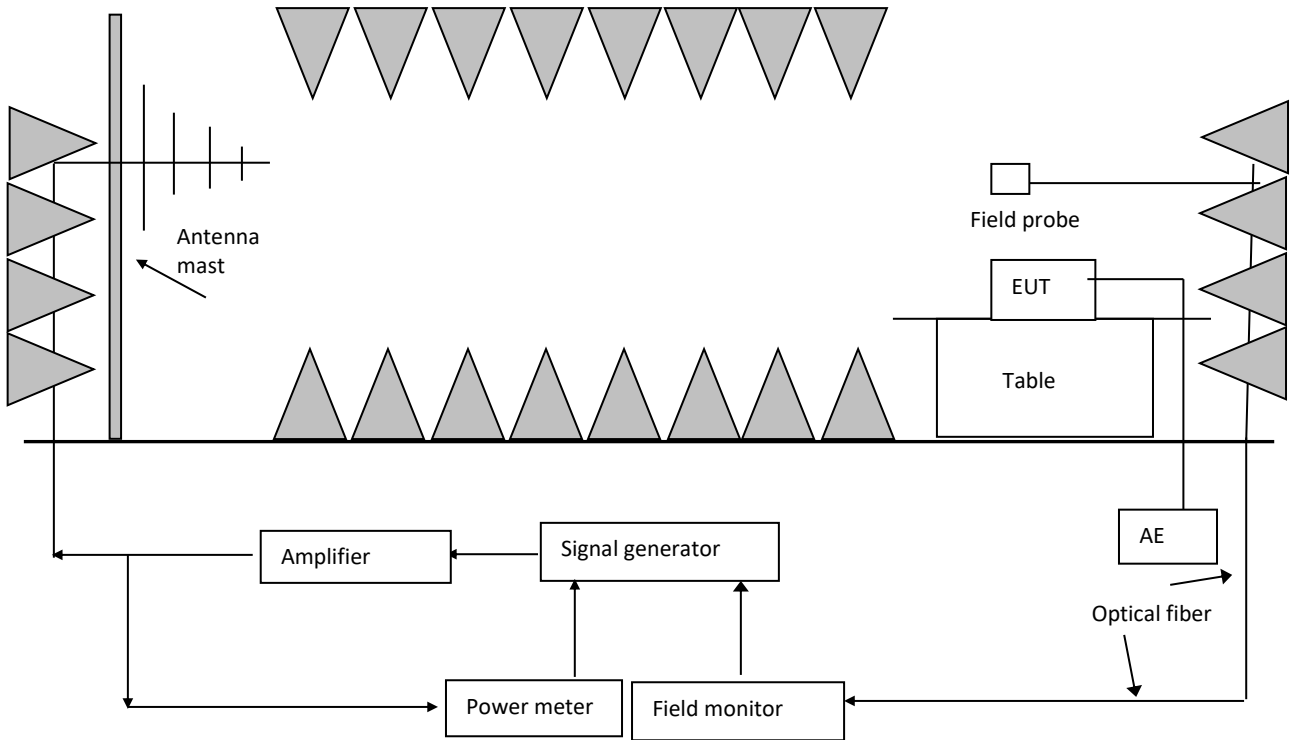
Notes:

1. X is an open test level. This level may be given in the product specification.
2. The gray row is the selected test level.

10.1.2 Performance Criterion

Performance criterion: **A**

10.2 Block diagram of test setup



10.3 Test Setup and Test Procedure

Measurement was performed in full-anechoic chamber.
 Measurement and setting of EUT was applied according to IEC 61000-4-3 clause 7.
 The test method and equipment was specified by IEC 61000-4-3 with additions and modifications by EN 61547 clause 5.3.

10.4 Test Protocol

Test no.:	Frequency (MHz)	Polarization	Test level V/m	Modulation	Exposed location	Pass/Fail/NA	Comment
1	80-1000	H & V	3	1kHz, 80%, SW, AM, 1% step size	All sides	Pass	-

Observation: All the functions were operated as normal during and after test, and there is no change in brightness.

Conclusion: The EUT met the requirements of Performance Criterion A.

11. Electric Fast Transient/Burst Immunity Test

Test result: NA

11.1 Severity Level and Performance Criterion

11.1.1 Test level

Open circuit output test voltage ($\pm 10\%$) and repetition rate of the impulses ($\pm 20\%$)				
Level	On power port, PE		On I/O (input & output) signal, data and control ports	
	Voltage peak kV	Repetition rate kHz	Voltage peak kV	Repetition rate kHz
1	0.5	5 or 100	0.25	5 or 100
2	1	5 or 100	0.5	5 or 100
3	2	5 or 100	1	5 or 100
4	4	5 or 100	2	5 or 100
X	Special	Special	Special	Special

Notes :

1. "X" is an open level. The level has to be specified in the dedicated equipment specification.
2. The gray rows were the selected test level.

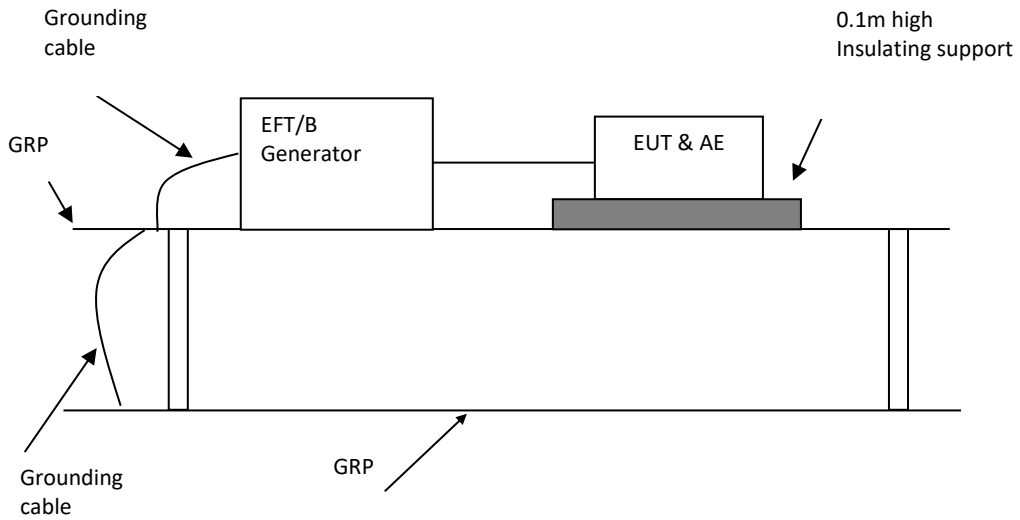
11.1.2 Performance Criterion

Performance criterion B (For emergency luminaires designed to operate in high-risk task areas, after the test, the luminous intensity shall be restored to its initial value within 0.5s.)

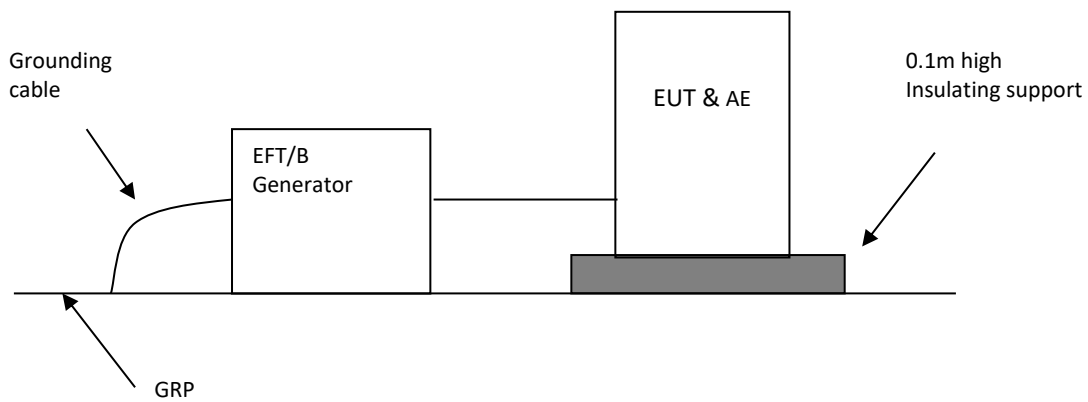
11.2 Block Diagram of Test Setup

11.2.1 Block Diagram for input a.c./d.c. power line

For table-top equipment

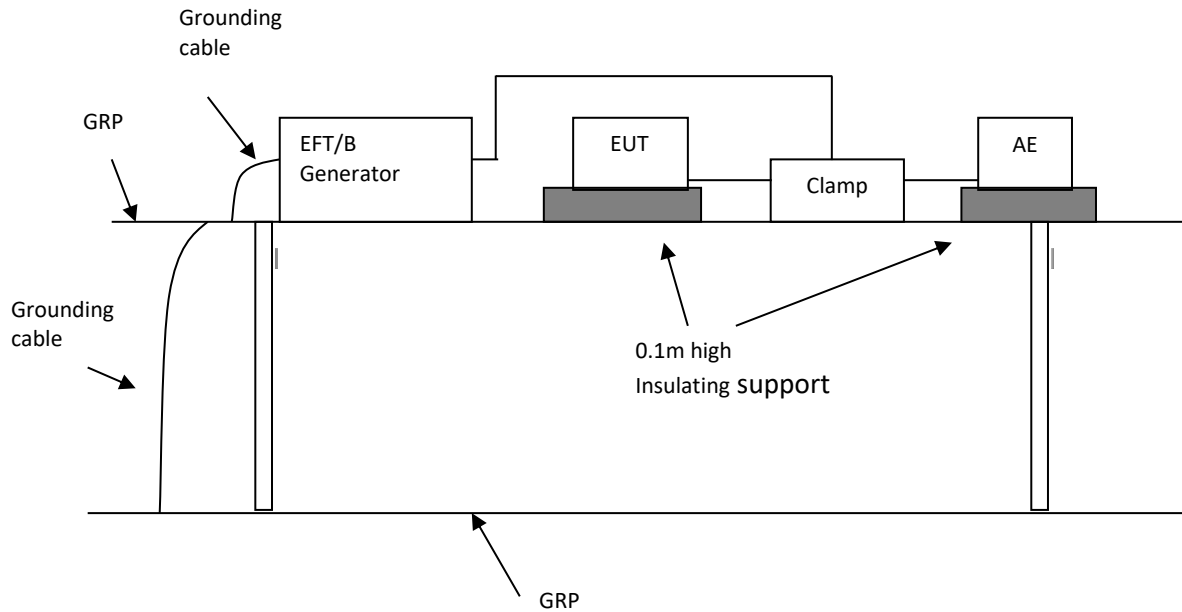


For floor standing equipment

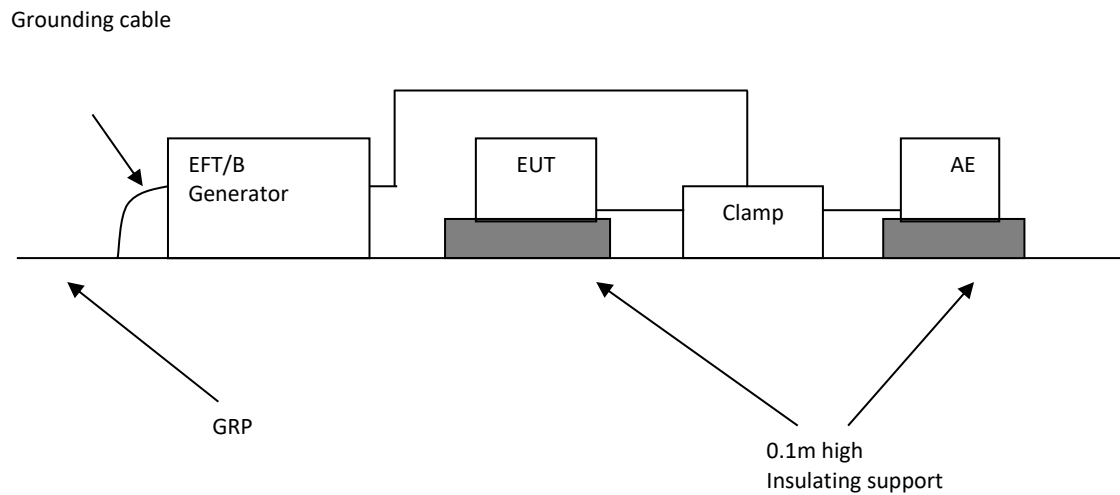


11.2.2 Block Diagram for output a.c./d.c. power line or signal/control lines

For table-top equipment



For floor standing equipment



11.3 Test Setup and Test Procedure

Measurement was performed in shielded room.

Measurement and setting of EUT was applied according to IEC 61000-4-4 clause 7.

The test method and equipment was specified by IEC 61000-4-4 with additions and modifications by EN 61547 clause 5.5.

11.4 Test Protocol

Test No.	Level [kV]	Polarity +/-	Repetition rate kHz	Line for test	Pass/Fail/NA
1	1	+/-	5	a.c. power ports	
2	0.5	+/-	5	d.c. power ports	
3	0.5	+/-	5	Signal lines and control lines	

Observation:**Conclusion:**

12. Surge Immunity Test

Test result: NA

12.1 Severity Level and Performance Criterion

12.1.1 Test level

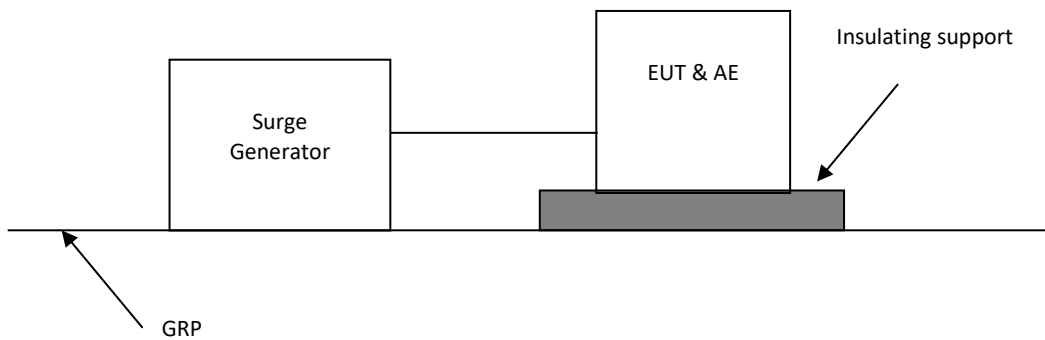
Level	Open-circuit test voltage $\pm 10\%$ kV
1	0.5
2	1.0
3	2.0
4	4.0
X*	Special
Notes: 1. "X" is an open class. This level can be specified in the product Specification 2. The gray rows are the selected level.	

12.1.2 Performance Criterion

Performance criterion **B**: Luminaires for emergency lighting (For emergency luminaires designed to operate in high-risk task areas, after the test, the luminous intensity shall be restored to its initial value within 0.5s.).

Performance criterion **C**: Others.

12.2 Block Diagram of Test Setup



12.3 Test Setup and Test Procedure

Measurement was performed in shielded room.

Measurement and setting of EUT was applied according to IEC 61000-4-5 clause 7.

The test method and equipment was specified by IEC 61000-4-5 with modifications by EN 61547 clause 5.7.

12.4 Test Protocol

Test No.	Level [kV]	Polarity +/-	Angle	Line for test	Pass/Fail/NA
1	0.5	+	90 ⁰	a.c. Mains (line to line)	
2	0.5	-	270 ⁰	a.c. Mains (line to line)	
3	1	+	90 ⁰	a.c. Mains (line to earth)	
4	1	-	270 ⁰	a.c. Mains (line to earth)	
5	1	+	90 ⁰	a.c. Mains (line to line)	
6	1	-	270 ⁰	a.c. Mains (line to line)	
7	2	+	90 ⁰	a.c. Mains (line to earth)	
8	2	-	270 ⁰	a.c. Mains (line to earth)	

Observation:

Conclusion:

13. Immunity to Conducted Disturbances, Induced by Radio-frequency Fields

Test result: NA

13.1 Severity Level and Performance Criterion

13.1.1 Test level

Frequency range 150kHz – 80MHz		
Level	Voltage level (e.m.f.)	
	U_0 [dB(uV)]	U_0 (V)
1	120	1
2	130	3
3	140	10
X	Special	Special

Notes:
 1. "X" is an open level.
 2. The gray row is the selected test level.

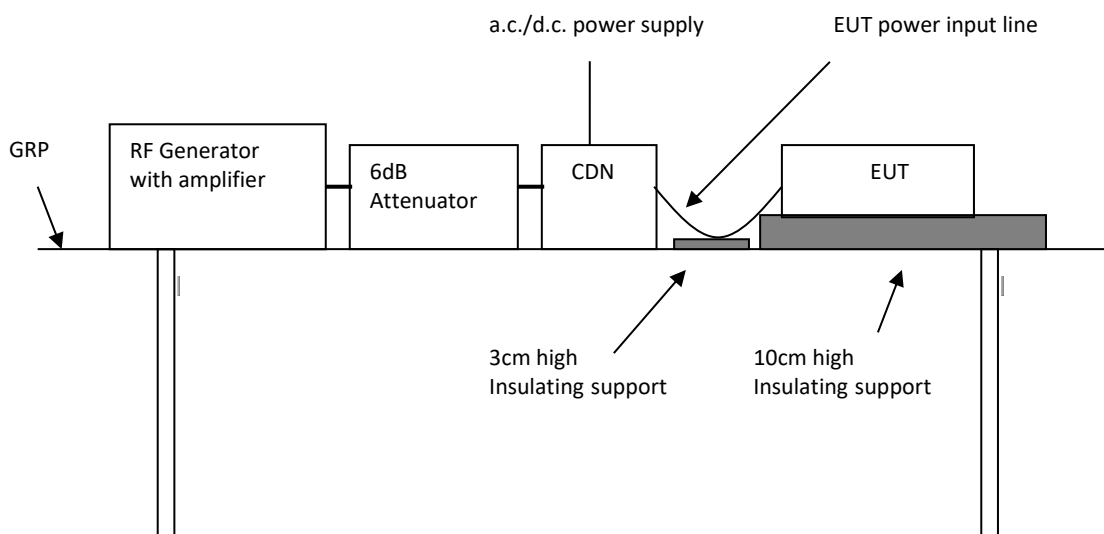
13.1.2 Performance Criterion

Performance criterion: A

13.2 Block Diagram of Test Setup

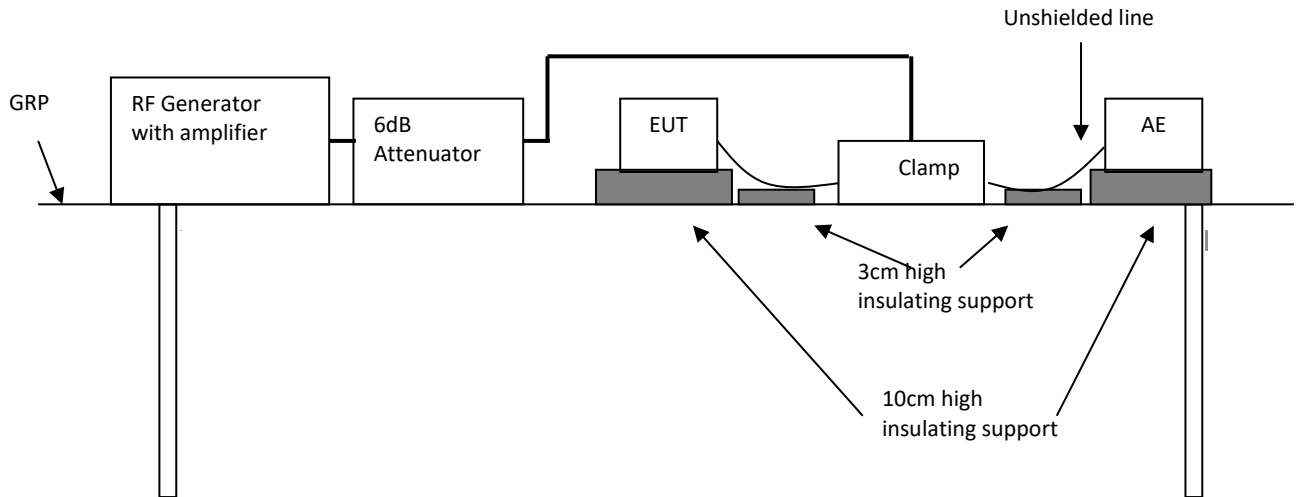
13.2.1 Block Diagram for a.c./d.c input power line

Block Diagram for a.c./d.c input power line

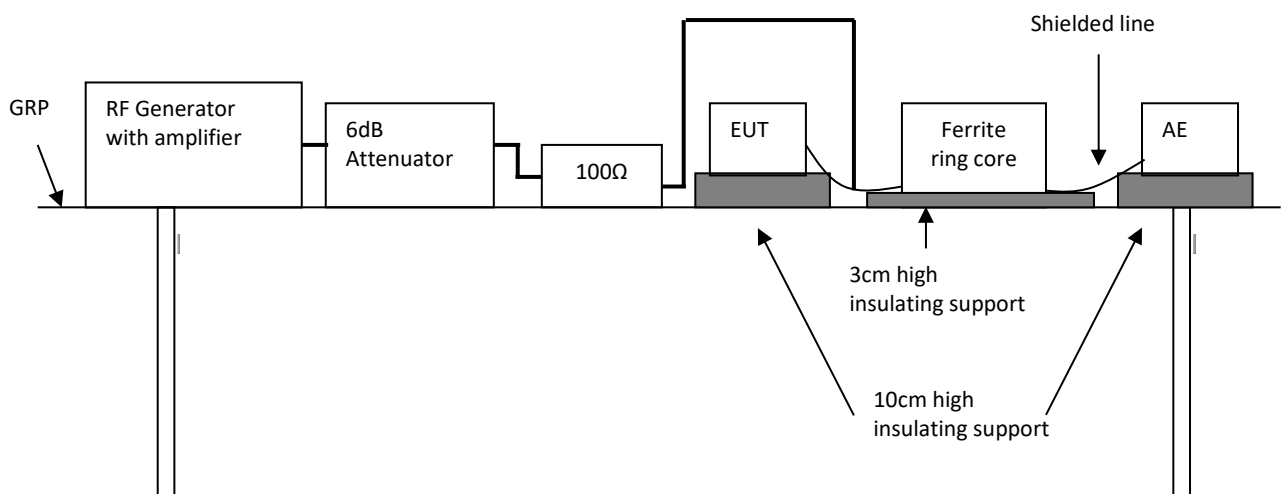


13.2.2 Block Diagram for output a.c./d.c. power line or signal/control lines

Unshielded line



Shielded line



13.3 Test Setup and Test Procedure

Measurement was performed in shielded room.

Measurement and setting of EUT was applied according to IEC 61000-4-6 clause 7.

The test method and equipment was specified by IEC 61000-4-6 with additions and modifications by EN 61547 clause 5.6.

13.4 Test Protocol

Test No.	Frequency (MHz)	Level V (r.m.s.)	Modulation	Injected point	Pass/Fail/NA
1	0.15~80	3	1kHz, 80%, SW, AM, 1% step size	a.c. Mains	
2	0.15~80	1	1kHz, 80%, SW, AM, 1% step size	d.c. power ports	
3	0.15~80	1	1kHz, 80%, SW, AM, 1% step size	signal lines and control lines	

Observation:

Conclusion:

14. Voltage Dips, Short Interruptions and Voltage Variations Immunity Test

Test result: NA

14.1 Severity Level and Performance Criterion

14.1.1 Test level

Test level	Voltage dip and short interruptions	Duration
% U _T	% U _T	(in period)
0	100	0.5*
		250
40	60	25
		10
70	30	0.5
		10
		X**

Notes:

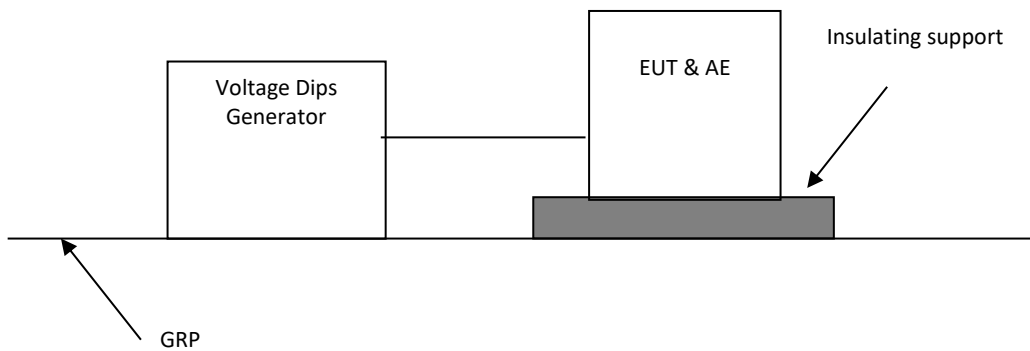
1. "*" for 0.5 period, the test shall be made in positive and negative polarity, i.e. starting at 0° and 180°, respectively.
2. "**" means "x" is an open duration. This duration can be given in the product specification. Utilities in Europe have measured dips and short interruptions of duration between ½ a period and 3000 periods, but duration less than 50 periods are most common.
3. If the EUT is tested for voltage dips of 100%, it is generally unnecessary to test for other levels for the same durations. However, for some cases (safeguard systems or electro-mechanical devices) it is not true. The product specification or product committee shall give an indication of the applicability of this note.
4. The gray rows are selected test level.

14.1.2 Performance Criterion

Performance criterion: C at the test level 70%.

Performance criterion: B at the test level 0% (For ballasts where the lamp is not able to restart within 1 min, due to the physical constrains of the lamp performance criterion C applies. For luminaires where the lamp is not able to restart within 1 min, due to the physical constraints of the lamp, performance criterion C applies.).

14.2 Block diagram of test setup



14.3 Test Setup and Test Procedure

Measurement was performed in shielded room.

Measurement and setting of EUT was applied according to IEC 61000-4-11 clause 7.

The test method and equipment was specified by IEC 61000-4-11 with additions and modifications by EN 61547 clause 5.8.

14.4 Test Protocol

Test no.	% U_T	Voltage dip and short interruptions % U_T	Duration (in periods)	Pass/Fail/NA
1	70	30%	10	
2	0	100% pos half cycle	0,5	
3	0	100% neg half cycle	0,5	

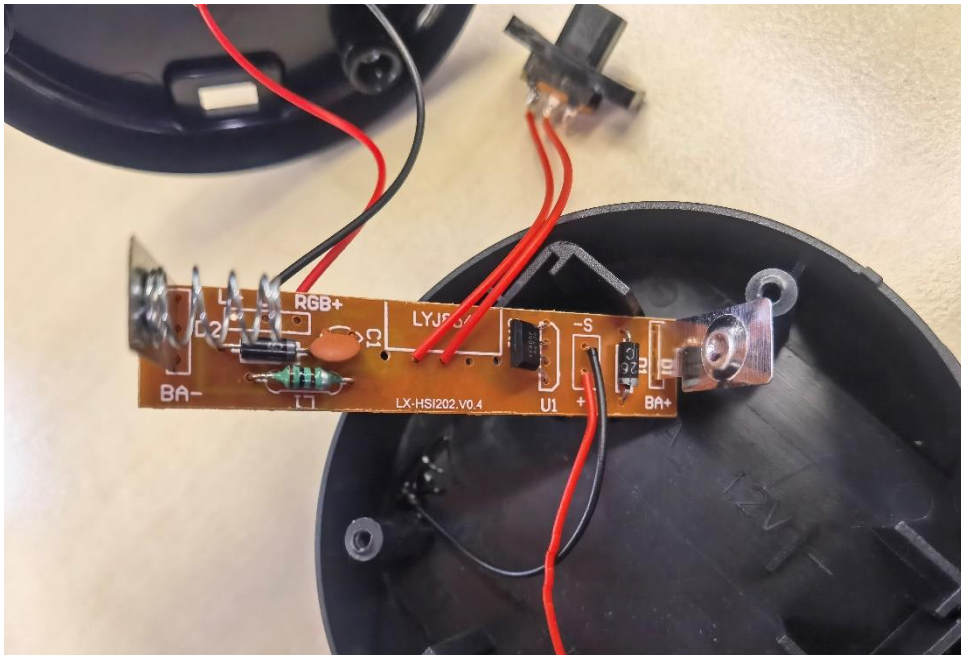
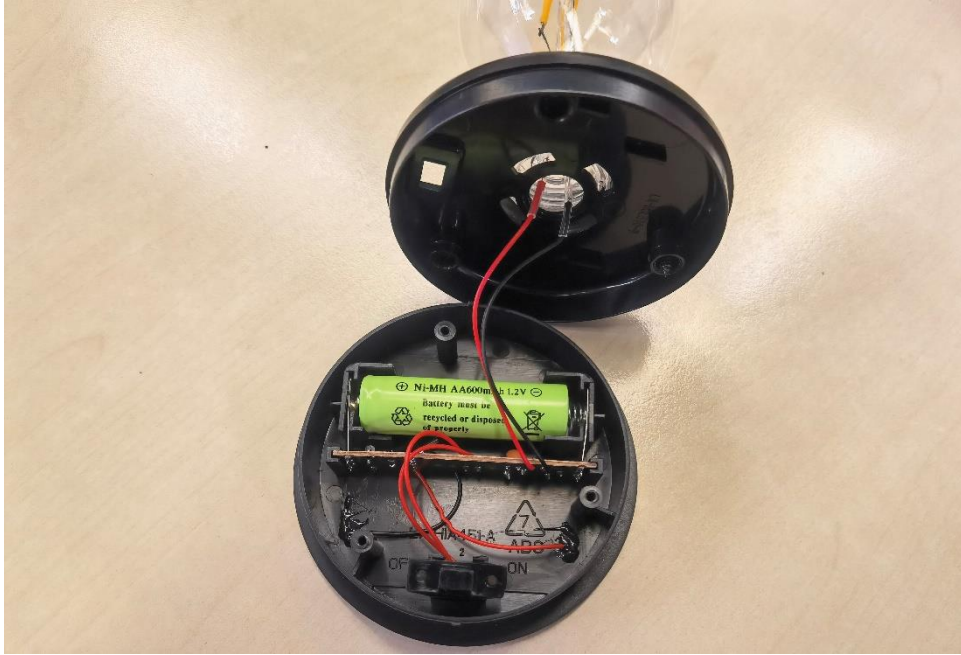
Observation:

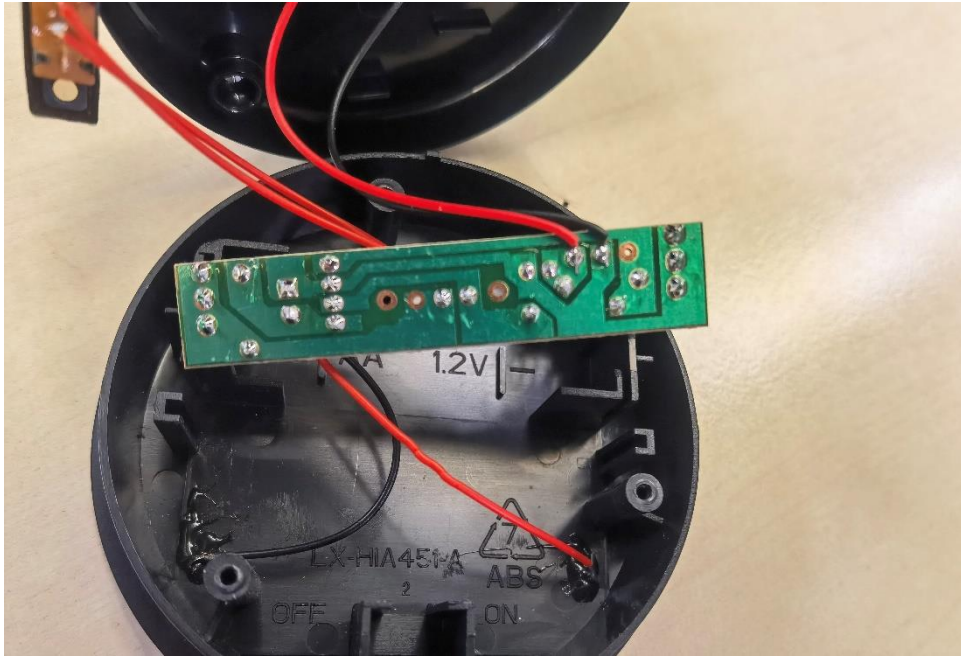
Conclusion:

Appendix I: Photograph of equipment under test

BT001



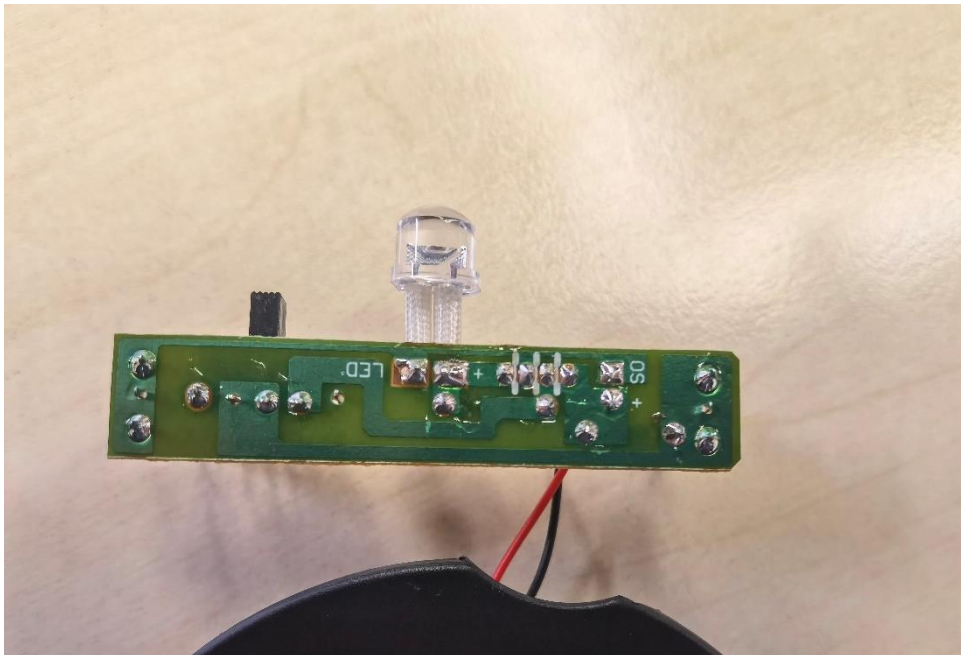
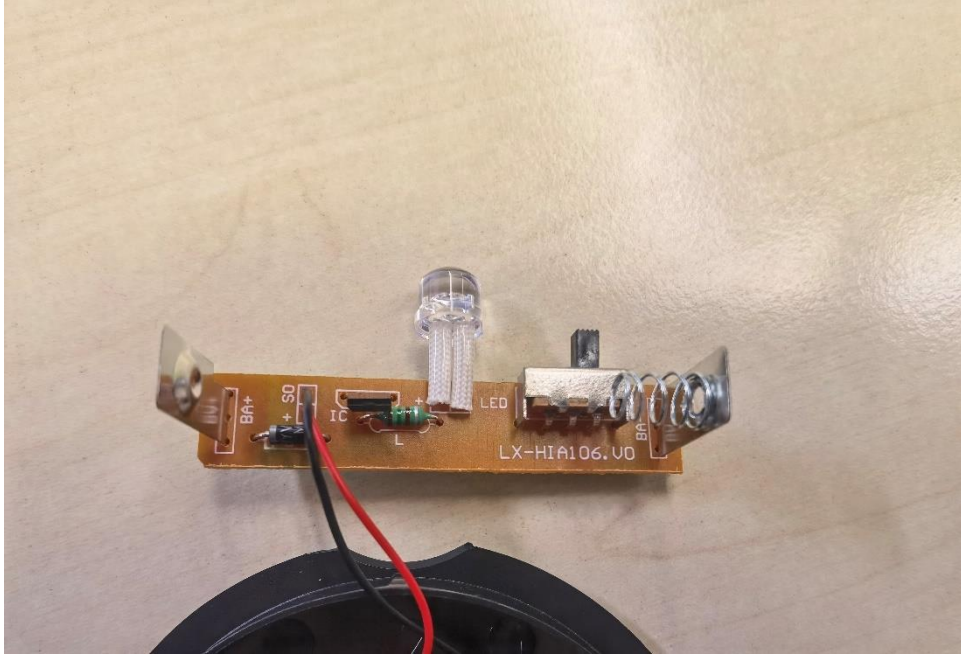




HSL003



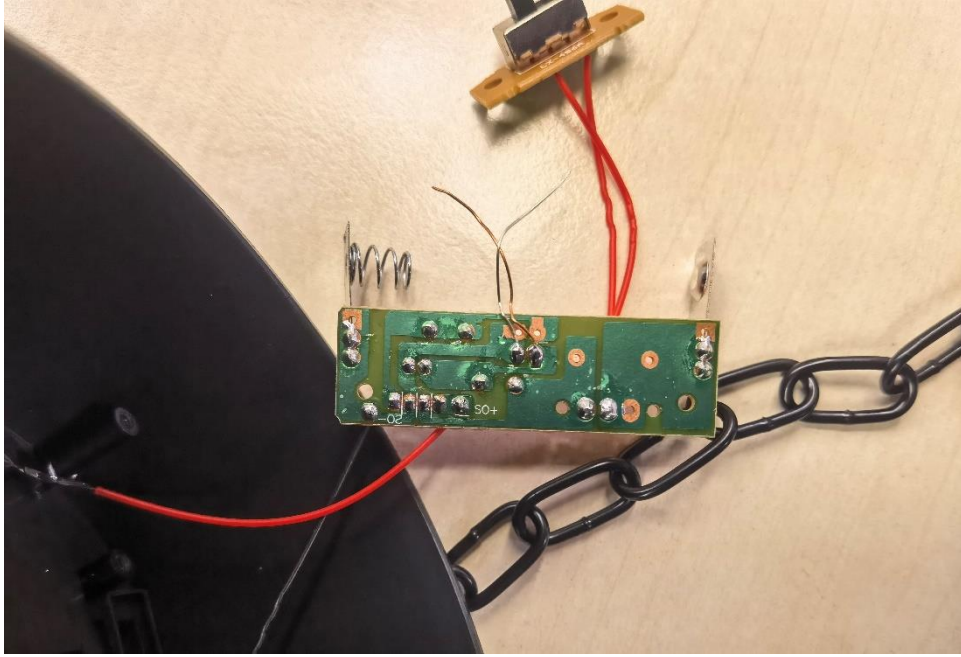




HSL087(Φ20CM)

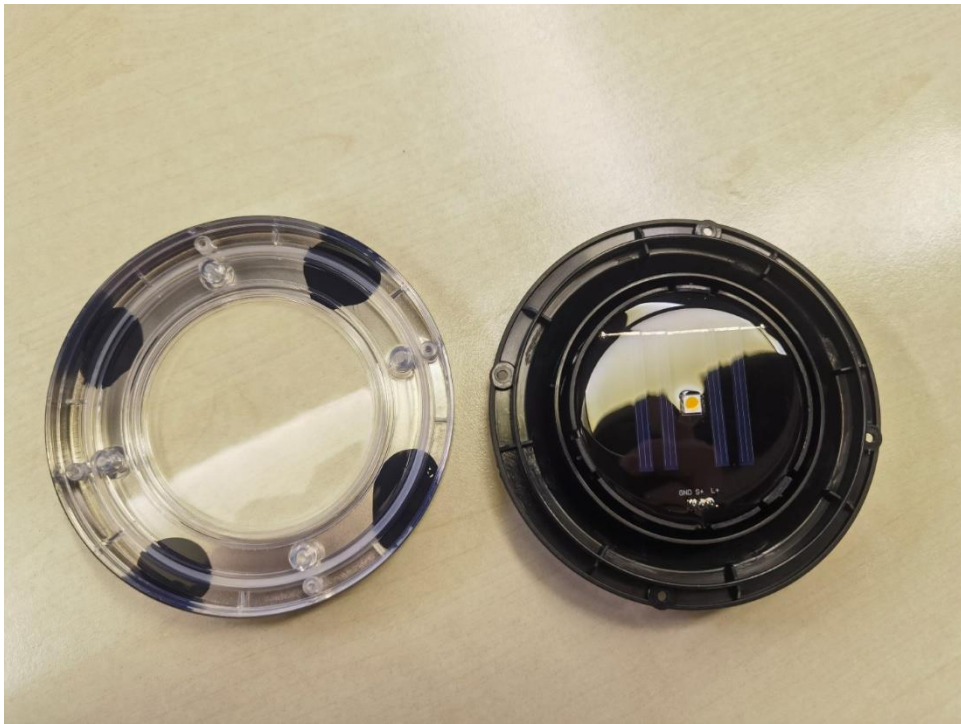


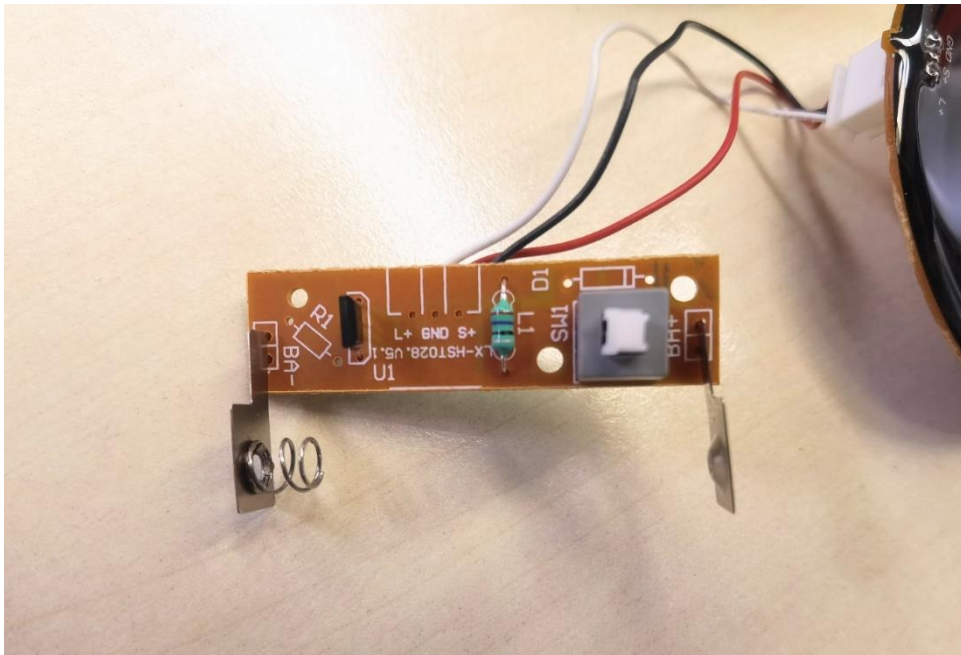
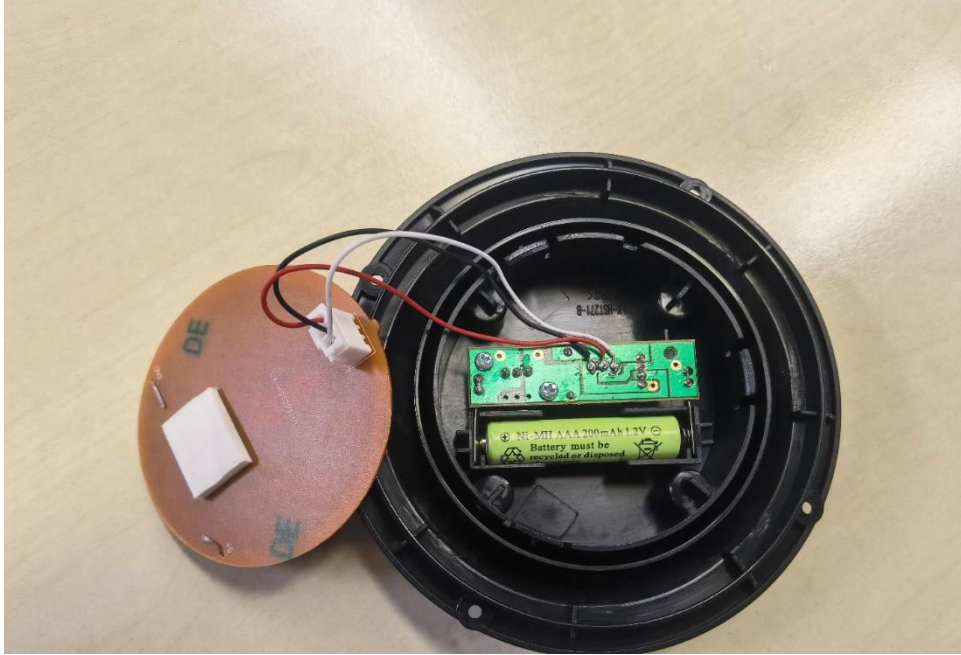


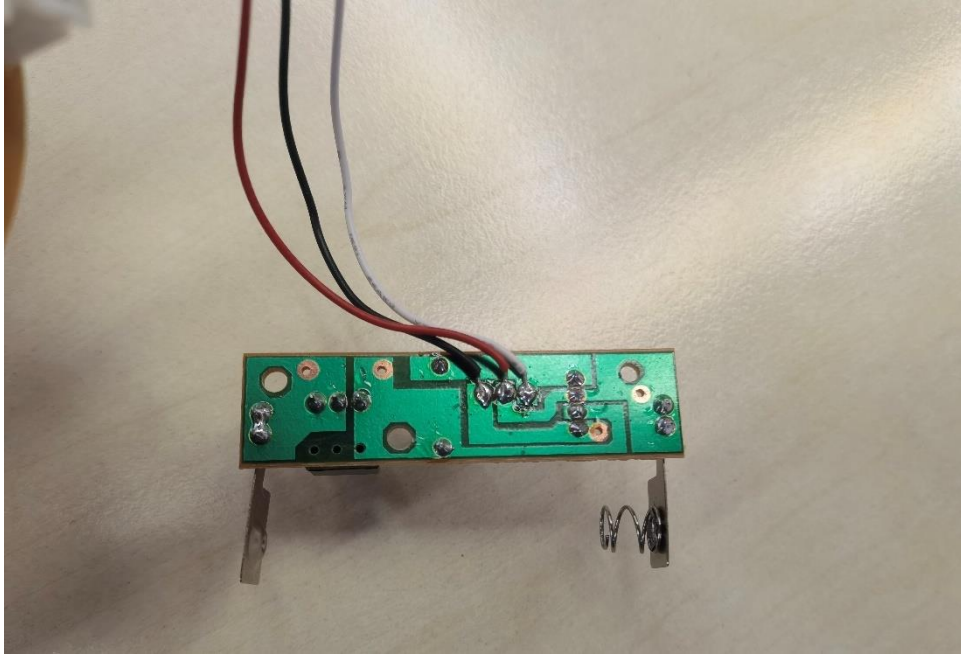


HPL028



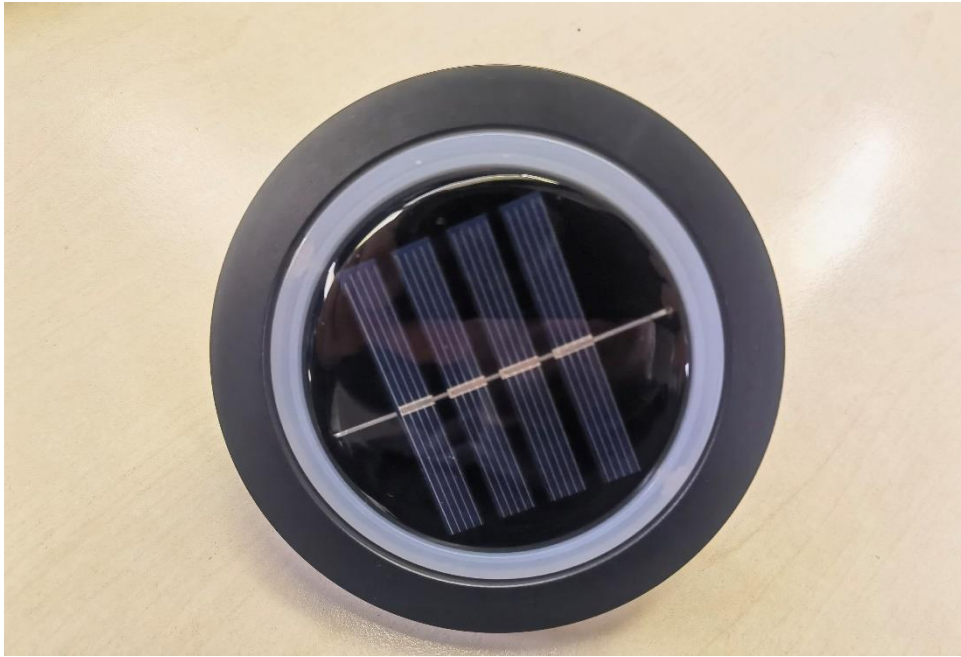


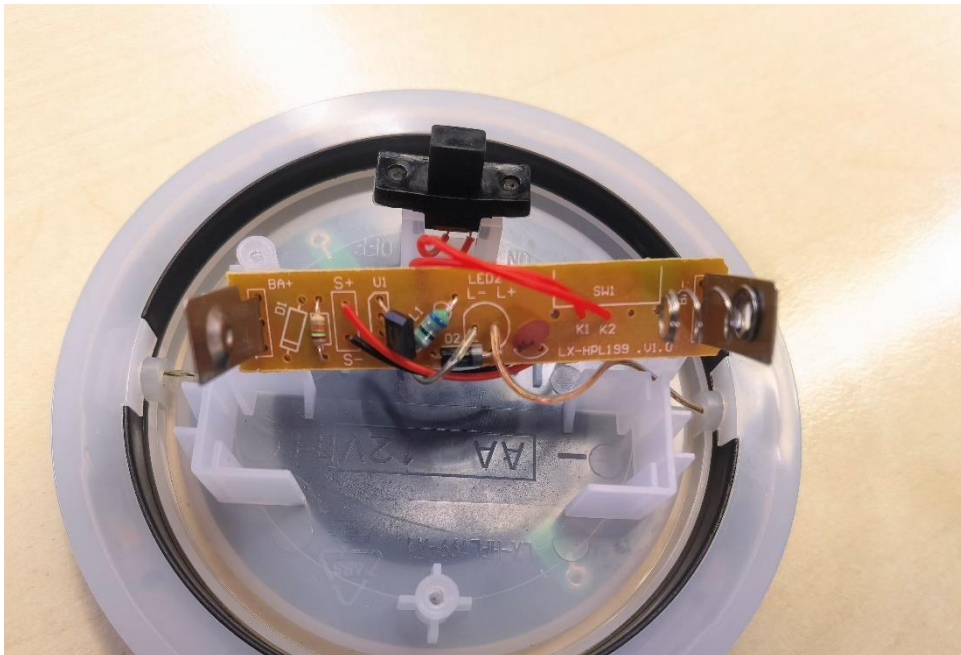


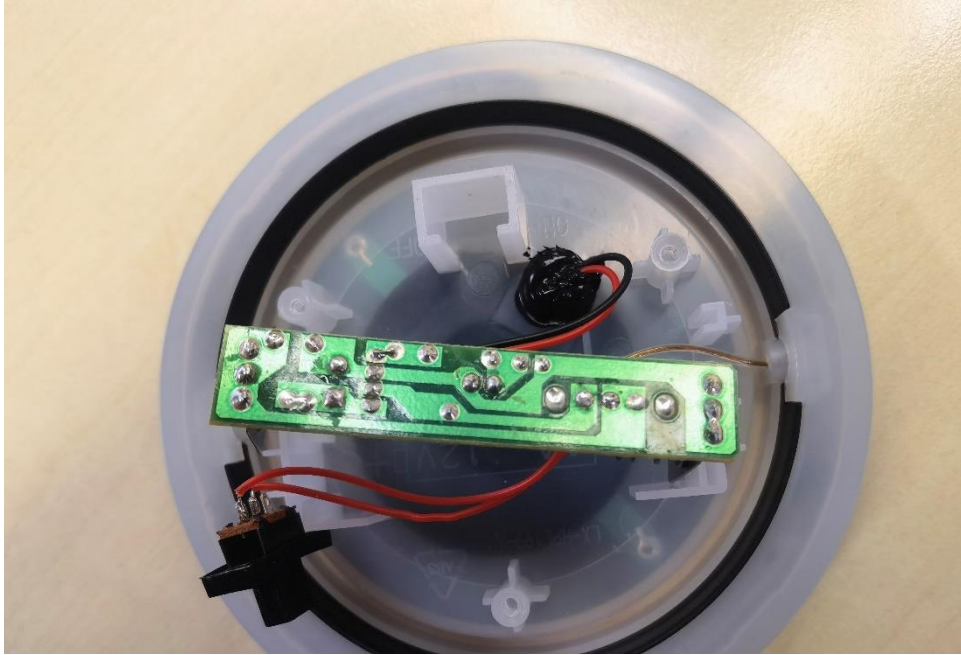


SL099



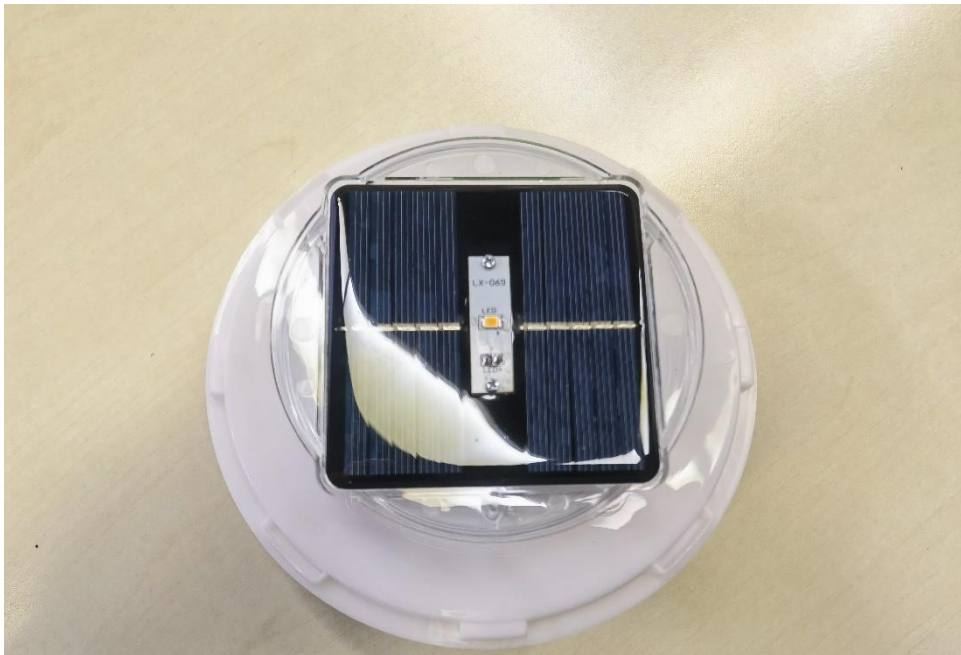
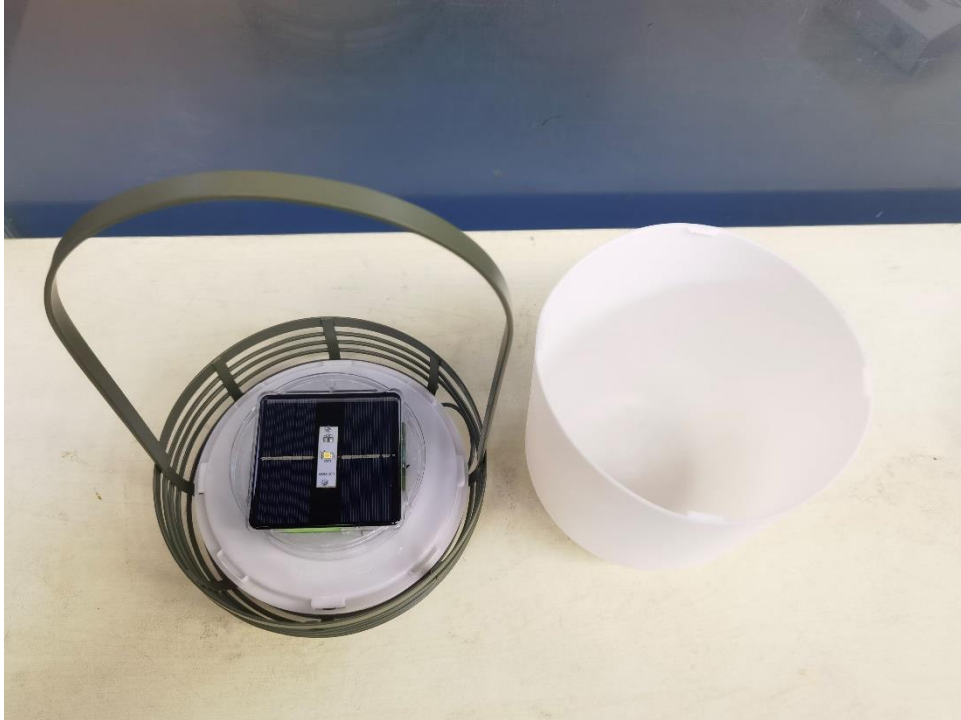


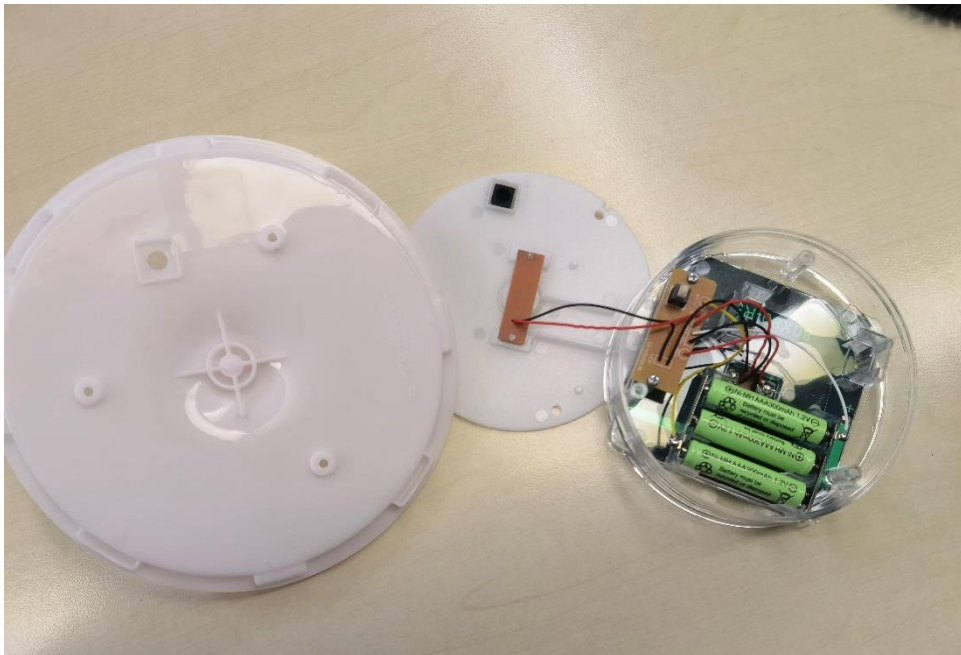
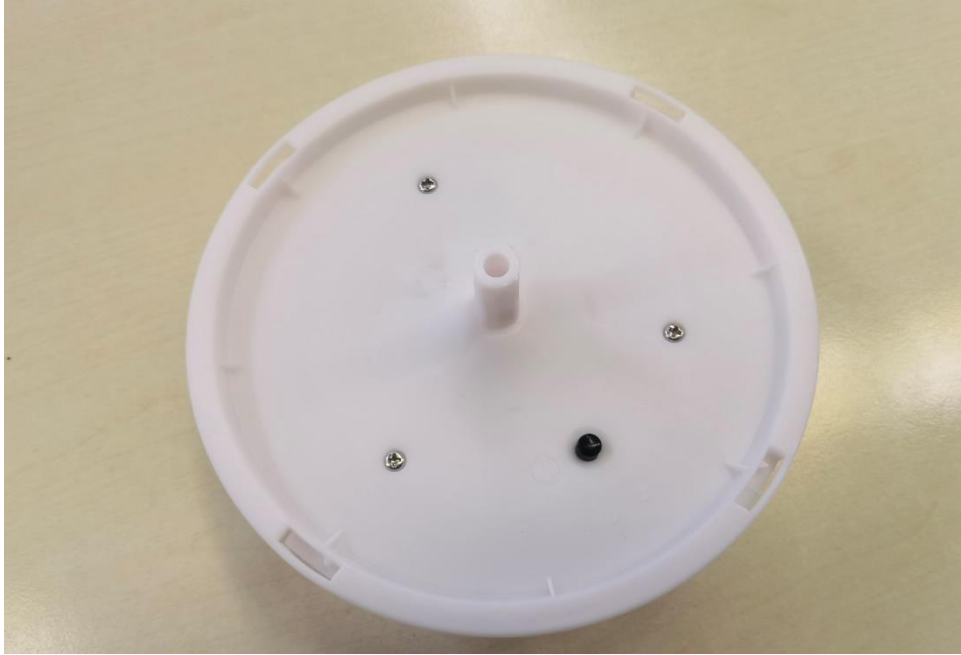


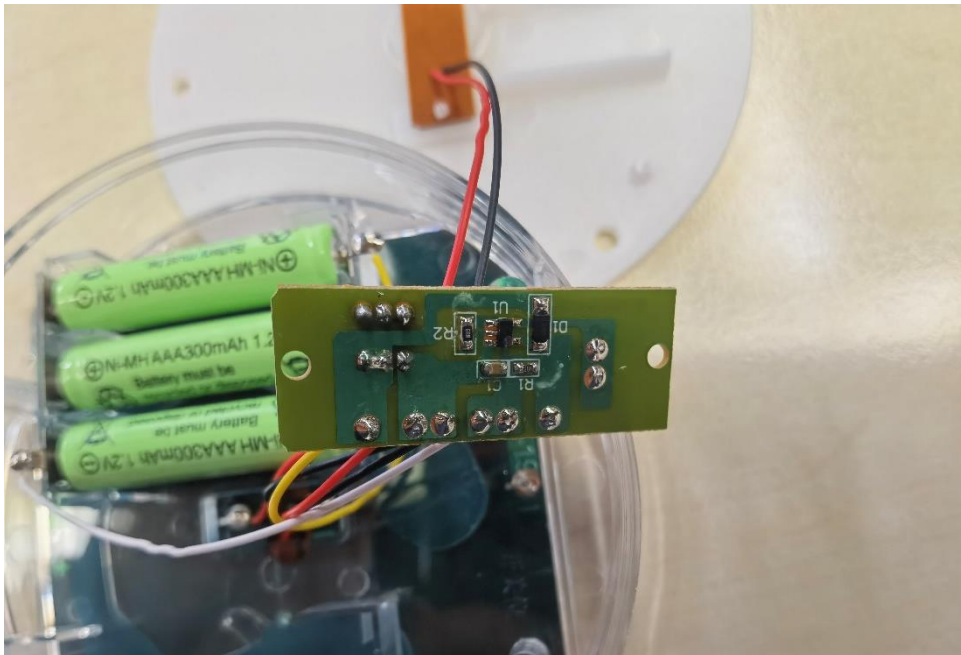
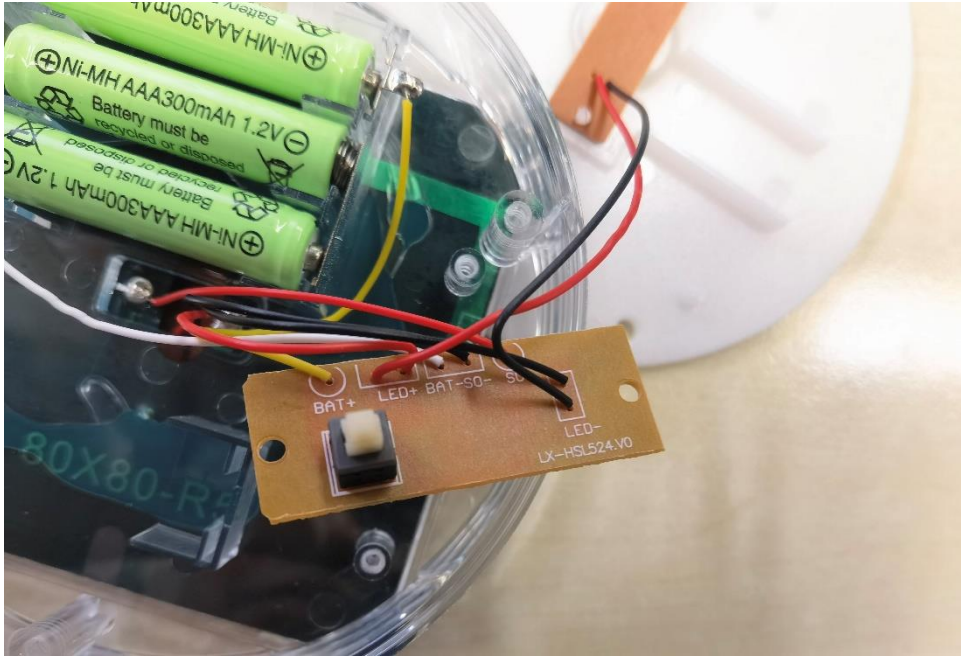















HSL100









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HSC001	
HX016	
HX017	
HX011	
HIA013-1	
HX007A	
HSL003	
HPL013	
FHL001	

HSL087(Φ20CM)	
HSL087(Φ12.5CM)	
HSC001(Φ18CM)	
BL022	
BL023	
BL187	
BC017	
BL041	
BL162	

HPL028	
BTD051	
BTD052	
BG001	
SL099	
HSL100	

Appendix II: Reference Model:

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HX052-20CM HX052-20cm HX052-25CM HX052-30CM HX052-15 HX052-20 HX052-25 HX052-30
HX053 HX054 HX054-NEW HX055 HX056 HX057 HX058 HX059 HX060 HX061 HX062 HX062-NEW
HX062-1 HX063 HX063-1 HX086 HX087 HX088 HX03B HX303 HX256

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HIA025 HIA026 HIA027 HIA028 HIA029 HIA030 HIA080F HIA080F1 HIA304 HIA245 HSI331 HIA305

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HSR301

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HSL049 HSL049-B HSL049S HSL049-S HSL050 HSL051 HSL052 HSL052-4 HSL053 HSL054 HSL055
HSL055B HSL055-1 HSL056 HSL057 HSL058 HSL058-1 HSL058-2 HSL058-3 HSL059 HSL060
HSL060F HSL060T HSL061 HSL062 HSL063 HSL064 HSL065 HSL066 HSL067 HSL068 HSL069
HSL070 HSL071 HSL072 HSL073 HSL074 HSL075 HSL076 HSL077 HSL078 HSL079 HSL080 HSL081
HSL082 HSL083 HSL084 HSL085 HSL086 HSL086-1 HSL086M HSL086S HSL086S-10 HSL086S-15
HSL086GS HSL086G HSL086MS HSL086B HSL087 HSL087F HSL087H HSL088 HSL089 HSL090
HSL140 HSL162 HSL303 HSL098F HSL524 HSL201 HSL100 HSL101

HSG001 HSG002 HSG003 HSG004 HSG005 HSG006 HSG007 HSG008 HSG009 HSG010 HSG011
HSG012 HSG013 HSG014 HSG015 HSG016 HSG017 HSG018 HSG019 HSG020

HSP001 HSP002 HSP003 NEW144-HSP003 HSP004 HSP005 HSP006 HSP007 HSP008 HSP009
HSP010 HSP011 HSP012 HSP013 HSP014 HSP015 HSP016 HSP017 HSP018 HSP019 HSP020
HSP021 HSP022 HSP023 HSP024 HSP025 HSP026 HSP027 HSP028 HSP029 HSP030

HST001 HST002 HST003 HST004 HST005 HST006 HST007 HST008 HST009 HST010 HST011 HST012
HST013 HST014 HST015 HST016 HST016-A HST016-B HST017 HST018 HST019 HST020 HST021
HST022 HST023 HST024 HST025 HST026 HST027 HST028 HST029 HST030 HST031 HST032
HST033 HST034 HST035 HST036 HST037 HST038 HST039 HST040 HST041 HST042 HST043
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HPE001 HPE002 HPE003 HPE004 HPE005 HPE006 HPE007 HPE008 HPE009 HPE010 HPE011
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SL001 SL002 SL003 SL004 SL005 SL006 SL007 SL008 SL009 SL010 SL011 SL-010B SL-010A SL-010B
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SS0010 SS0030 SS0031-2 SS0042 SS0124 SS031-1 SS0015 SS070 SS072 SS073 SS074 SS075 SS076
SS0089 SS0089-1 SS0089-2 SS0120 SS0123 SS0124 SS0122 SS0127 LV-221BIRGB LV-0015C GA-
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*****END of the report*****