EMC TEST REPORT

No. ETA22020001S-002

Applicant	:	Hangzhou Longlux Electronic Technology Co., Ltd The Western Science Park, Hangzhou City, China
Manufacturing site Name & Address	:	Hangzhou Longlux Electronic Technology Co., Ltd The Western Science Park, Hangzhou City, China
Equipment	:	Luminaires for emergency lighting
Type/Mode	:	LLX-EM-TWIN-1

SUMMARY

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

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

EN 61547:2009: Equipment for general lighting purposed EMC immunity requirements

EN IEC 61000-3-2:2019: Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16A per phase)

EN 61000-3-3:2013+A1: 2019: 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 ≤ 16A per phase and not subject to conditional connection

Date of issue: February 17, 2022

Prepared by: Approved by:

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1. GENERAL INFORMATION

1.1 Description of Equipment under Test (EUT)

EUT	:	Luminaires for emergency lighting
Description of EU	:	The product covered by this report is Class II Luminaires for emergency lighting for indoor use. All relevant tests are applied to LLX-EM-TWIN-1 which gives the most unfavourable test result.
Model number	:	LLX-EM-TWIN-1
Rating	:	Input:85-240V~; 50/60Hz; Output: 2×3W; Class II; IP20; 2700-6500K; ta:-20-40℃
Brand name	:	N/A
Mains lead	:	0 m
Data cable	:	None
EUT type	:	☒ Table top ☐ Floor standing
Sample received date	:	January 13, 2022
Date of test	:	January 13, 2022 ~ February 17, 2022

1.2 Description of Test Facility

Name	ETA Testing Technology Co., Ltd Hangzhou ETA Testing Technology Co., Ltd
Address	8/F., Building A, The Western Science Park, Yuhang District, Hangzhou, Zhejiang, China
Telephone	86 571 88610058
Telefax	86 571 88610058

2. TEST SPECIFICATIONS

2.1 Standards

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

EN 61547:2009: Equipment for general lighting purposed EMC immunity requirements

EN IEC 61000-3-2:2019: Electromagnetic compatibility (EMC) - Part 3-2: Limits - Limits for harmonic current emissions (equipment input current ≤ 16A per phase)

EN 61000-3-3:2013+A1:2019: 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 ≤ 16A per phase and not subject to conditional connection

2.2 Mode of operation during the test

2.2.1 Description of operation

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.

2.2.2 Test Peripherals

Equipment description (Including Brand name)	Model & Serial	Cable description (List Length, Type & Purpose)
-	-	-

2.3 Test Summary

This report is for the exclusive use of ETA's Client and is provided pursuant to the agreement between ETA and its Client. ETA's responsibility and liability are limited to the terms and conditions of the agreement. ETA assumes no liability to any party, other than to the Client in accordance with the agreement, for any loss, expense or damage occasioned by the use of this report. Only the Client is authorized to permit copying or distribution of this report and then only in its entirety. Any use of the ETA name or one of its marks for the sale or advertisement of the tested material, product or service must first be approved in writing by ETA. The observations and test results in this report are relevant only to the sample tested. This report by itself does not imply that the material, product, or service is or has ever been under an ETA certification program.

TEST ITEM	RESULT	NOTE
Mains terminal continuous disturbance voltage	Pass	
Radio frequency magnetic field emission	Pass	
Insertion loss	NA	
Radiated Emission	Pass	
Harmonics	Pass	
Voltage fluctuation-Flicker	Pass	
Electrostatic Discharge (ESD)	Pass	
Electric Fast Transient /Burst (EFT/B)	Pass	
Surge	Pass	
Injected Current	Pass	
RF electromagnetic field susceptibility	Pass	
Voltage dips and interruption	Pass	

Notes:

1. NA =Not Applicable.
2. Margin to the limit is within the uncertainty interval of the measured value.

Emission Test

3. Mains/Load/Control Terminal Continuous Disturbance Voltage

Test result: PASS

3.1 Terminal Voltage Limits for the frequency range 9kHz to 30MHz

3.1.1 Disturbance voltage limits at mains terminals

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

Notes:

1. * means the limit decreasing linearly with the logarithm of the frequency in the range 0.05MHz ~ 0.15MHz and 0.15MHz to 0.5MHz.
2. 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.

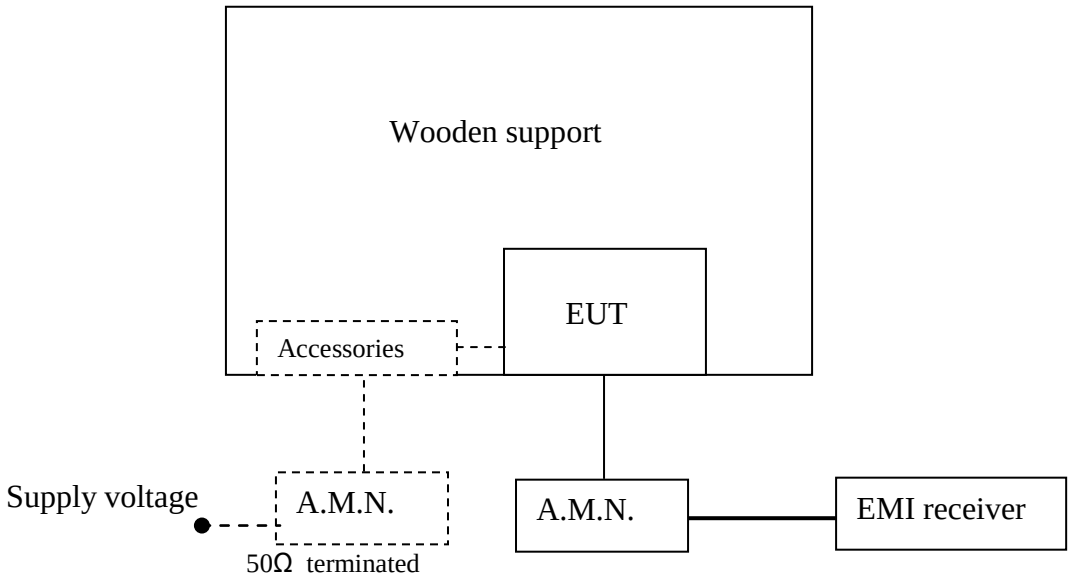
3.1.2 Disturbance voltage limits at load and control terminals

Frequency range (MHz)	Limits dB(μV) Quasi-peak	Average
0.15 ~ 0.5	80	70
0.5 ~ 5	74	64
5 ~ 30	74	64

Note: 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

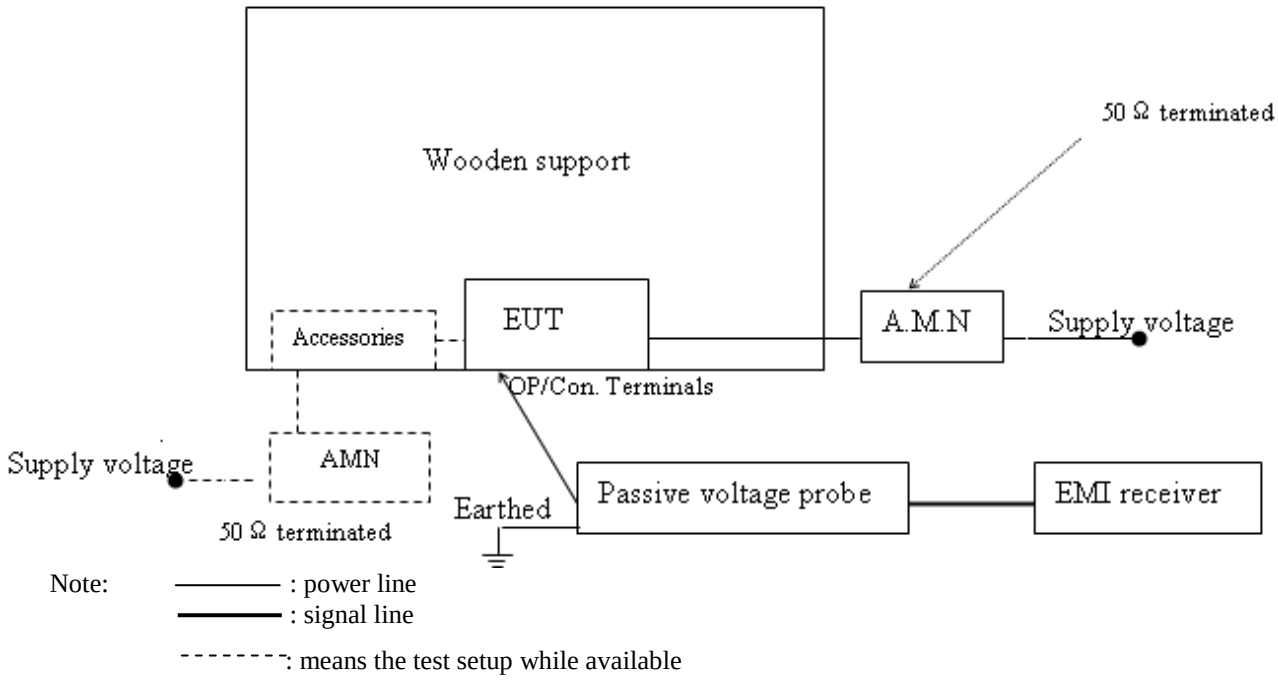
☒ At mains terminal



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

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

☐ At output and control terminals



3.3 Test Setup and Test Procedure

3.3.1 Test setup

Detailed test procedure and arrangement was following clause 8 of EN 55015.
Operation conditions of EUT were according to clause 6 of EN 55015.
Measurement was carried out with lamps which have been in operation for:

2h for incandescent lamps;
100h for fluorescent lamps.

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

5 min for incandescent lamp;
15 min for fluorescent lamp;
30 min for other discharge lamps.

3.3.2 Test procedure

All measurements were according to clause 8.1.1, 8.1.2, 8.1.3, 8.1.4 and 8.1.5 of EN 55015 and For:

☒ Indoor luminaires
The measurement was carried in accordance with clause 8.2 of EN 55015

☐ Outdoor luminaires
The measurement was carried in accordance with clause 8.2 of EN 55015

☐ Independent light regulating devices
The measurement was carried in accordance with clause 8.3 of EN 55015

☐ Independent transformers and convertors for incandescent lamps or LED light sources
The measurement was carried in accordance with clause 8.4 of EN 55015

☐ Independent ballasts for fluorescent and other discharge lamps
The measurement was carried in accordance with clause 8.5 of EN 55015

☐ Self-ballasted lamps and semi-luminaires
The measurement was carried in accordance with clause 8.6 of EN 55015

☐ UV and IR radiation appliances
The measurement was carried in accordance with clause 8.7 of EN 55015

☐ Self-contained emergency lighting luminaires
The measurement was carried in accordance with clause 8.8 of EN 55015

☐ Independent starters and igniters for fluorescent and other discharge lamps
The measurement was carried in accordance with clause 8.9 of EN 55015

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

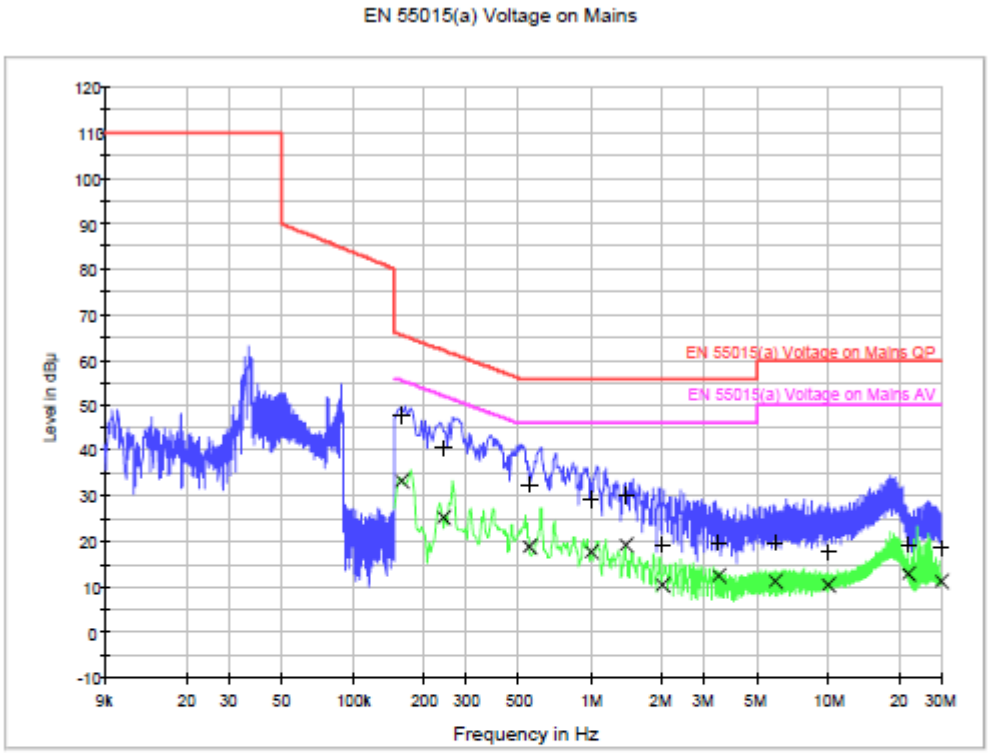
Temperature : 24°C

Relative Humidity : 52 %

For mains terminal: Pass

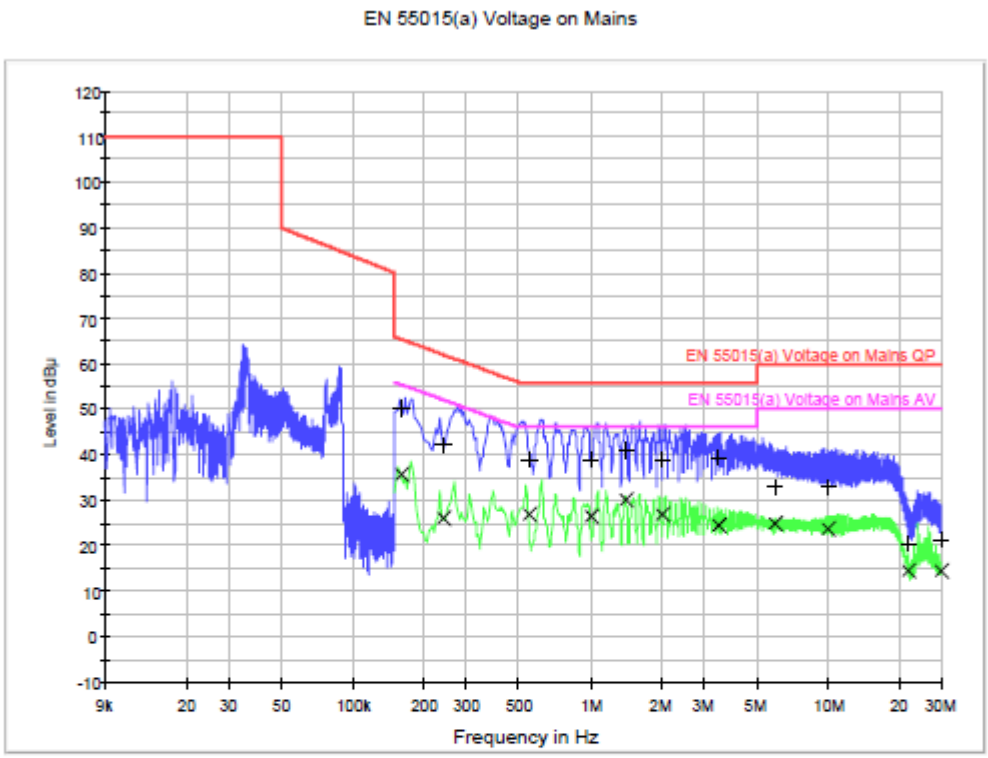
For LLX-EM-TWIN-1

L-Line



Frequency (MHz)	QuasiPeak (dBµV)	Margin - QPK (dB)	Limit - QPK (dBµV)	CAverage (dBµV)	Margin - AV (dB)	Limit - AV (dBµV)
0.160000	47.67	17.79	65.46	33.14	22.33	55.46
0.240000	40.63	21.47	62.10	25.46	26.63	52.10
0.550000	32.60	23.40	56.00	19.07	26.93	46.00
1.000000	29.39	26.61	56.00	17.57	28.43	46.00
1.400000	30.27	25.73	56.00	19.13	26.87	46.00
2.000000	19.13	36.87	56.00	10.37	35.63	46.00
3.500000	19.55	36.45	56.00	12.63	33.37	46.00
6.000000	19.53	40.47	60.00	11.20	38.80	50.00
10.000000	17.67	42.33	60.00	10.30	39.70	50.00
22.000000	19.15	40.85	60.00	13.06	36.94	50.00
30.000000	18.48	41.52	60.00	11.27	38.73	50.00

N-Line



Frequency (MHz)	QuasiPeak (dBµV)	Margin - QPK (dB)	Limit - QPK (dBµV)	CAverage (dBµV)	Margin - AV (dB)	Limit - AV (dBµV)
0.160000	50.04	15.42	65.46	35.91	19.56	55.46
0.240000	42.18	19.92	62.10	26.30	25.80	52.10
0.550000	38.80	17.20	56.00	26.95	19.06	46.00
1.000000	39.10	16.90	56.00	26.43	19.57	46.00
1.400000	40.94	15.06	56.00	30.07	15.93	46.00
2.000000	38.85	17.16	56.00	26.80	19.20	46.00
3.500000	39.31	16.69	56.00	24.48	21.52	46.00
6.000000	33.04	26.96	60.00	24.80	25.20	50.00
10.000000	32.91	27.09	60.00	23.57	26.43	50.00
22.000000	20.68	39.32	60.00	14.42	35.58	50.00
30.000000	21.47	38.53	60.00	14.58	35.42	50.00

For load/control terminal: NA

Frequency (MHz)	Quasi-peak		Average	
	Disturbance level dB(⎾V)	Permitted limit dB(⎾V)	Disturbance level dB(⎾V)	Permitted limit dB(⎾V)
-	-	-	-	-
-	-	-	-	-
-	-	-	-	-
Note: * means the emission level 20dB below the relevant limit.				

3.5 Measurement Uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.

Measurement uncertainty at mains terminal: ±2.96dB (0.15MHz-30MHz), ±3.32dB (9kHz-150kHz)

Measurement uncertainty at load/control terminal: ±2.61/±3.38dB.

The measurement uncertainty is given with a confidence of 95%, k=2.

3.6 Additions, Deviations and Exclusions from Standards

None.

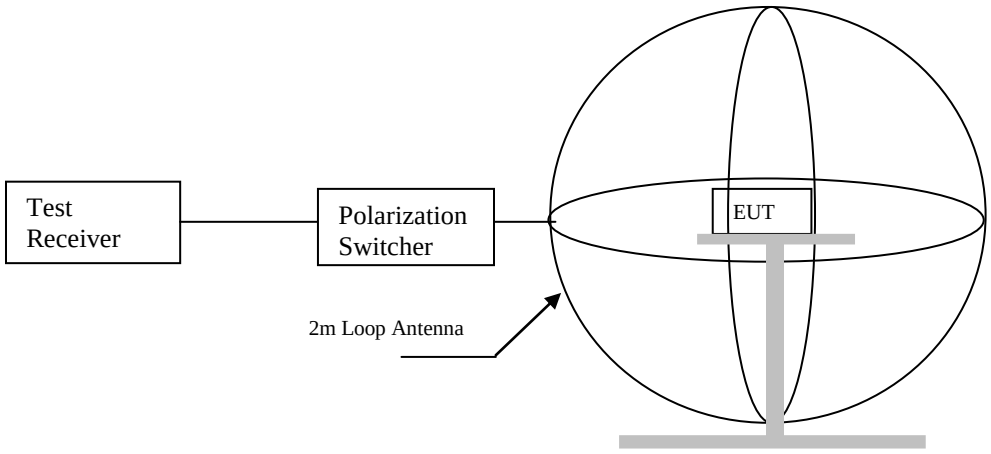
4. Radiated Electromagnetic Disturbance

Test result: PASS

4.1 Radiated Electromagnetic Disturbance Limit for frequency range 9kHz to 30MHz

Frequency Range	Limits for loop diameter dB(μA) (a)		
	2m	3m	4m
9kHz – 70kHz	88	81	75
70kHz - 150kHz	88 to 58 (b)	81 to 51 (b)	75 to 45(b)
150kHz – 3.0MHz	58 to 22 (b)	51 to 15 (b)	45 to 9 (b)
3.0MHz – 30MHz	22	15 to 16 (c)	9 to 12 (c)
Notes: a: At the transition frequency, the lower limit applies. b: Decreasing linearly with the logarithm of the frequency. c: Increasing linearly with the logarithm of the frequency.			

4.2 Block Diagram of Test Setup



4.3 Test Setup and Test Procedure

Measurement was performed in shielded room, and instruments used were following clause 9.1.1 of EN 55015.

Detailed test procedure and arrangement was following clause 9 of EN 55015.

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).

4.4 Test Protocol

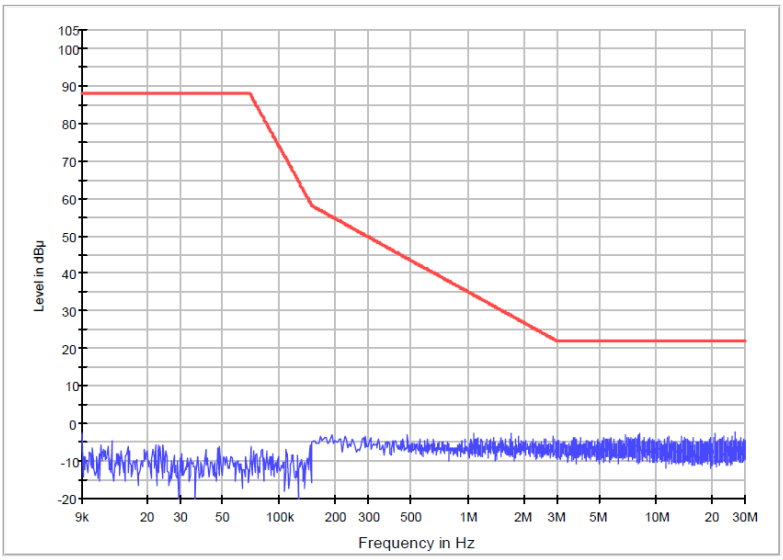
Temperature : 24 °C

Relative Humidity : 48%

The worst testing data is listed in the report as representative.

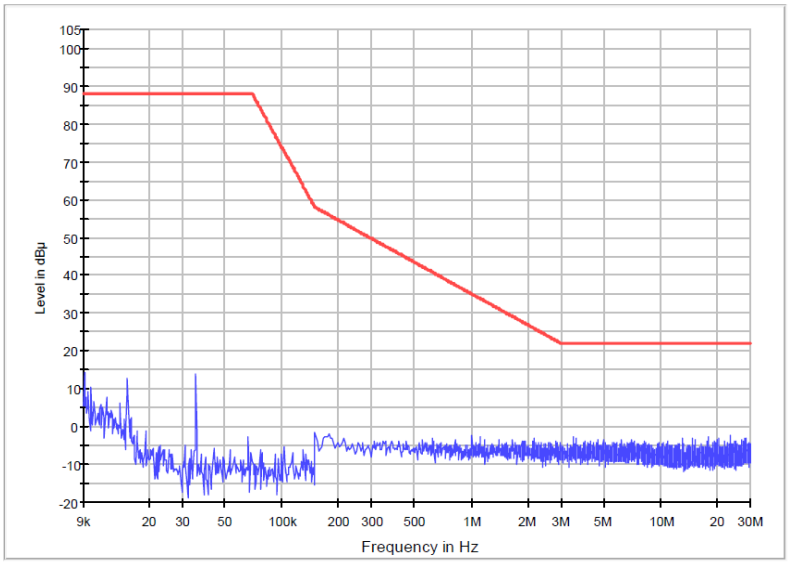
X direction

TripleLoop(a)

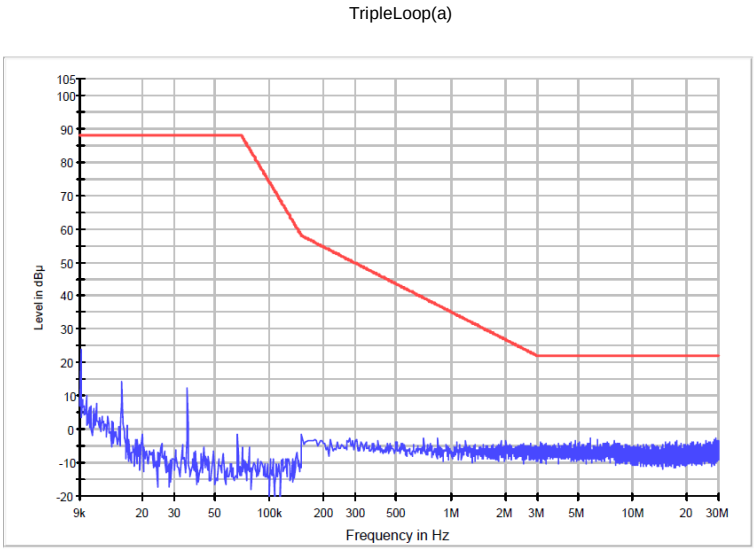


Y direction

TripleLoop(a)



Z direction



Frequency /MHz	Quasi-peak (dBµA) Disturbance level X direction	Y direction	Z direction	Permitted limit
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.				

4.5 Measurement Uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.

Measurement uncertainty of radiated disturbance: ±2.82dB (0.15MHz-30MHz), ±2.91dB(9kHz - 150kHz).

The measurement uncertainty is given with a confidence of 95%, k=2.

4.6 Additions, Deviations and Exclusions from Standards

None.

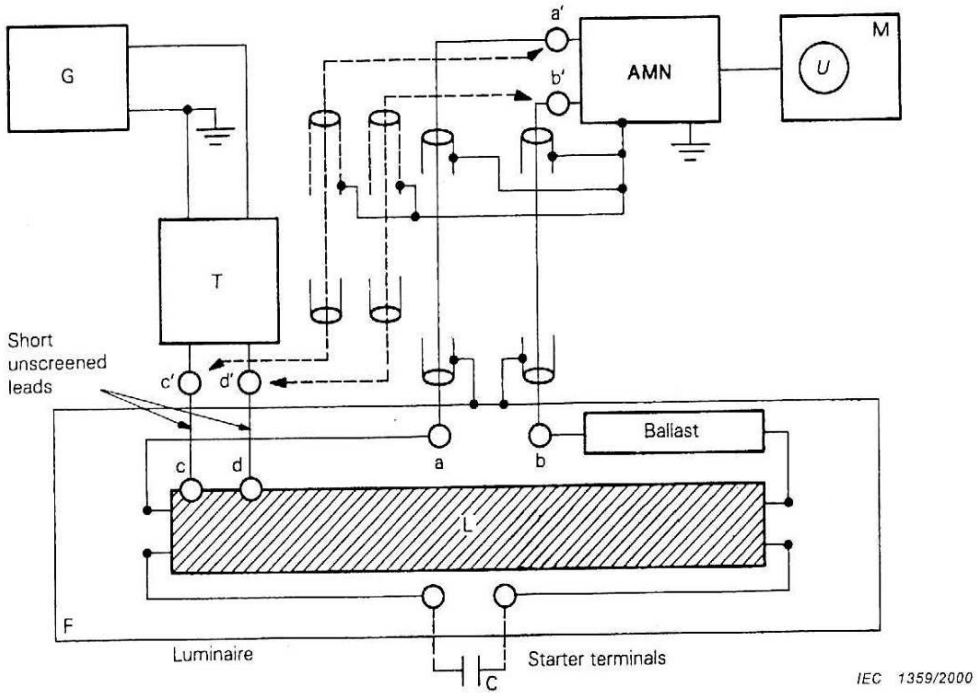
5. Insertion Loss

Test result: NA

5.1 Insertion loss limit

Frequency range (kHz)	Minimum Values (dB)
150 to 160	28
160 to 1400	28 to 20*
1400 to 1605	20
Note: *means decreasing linearly with the logarithm of frequency.	

5.2 Block diagram of test set up

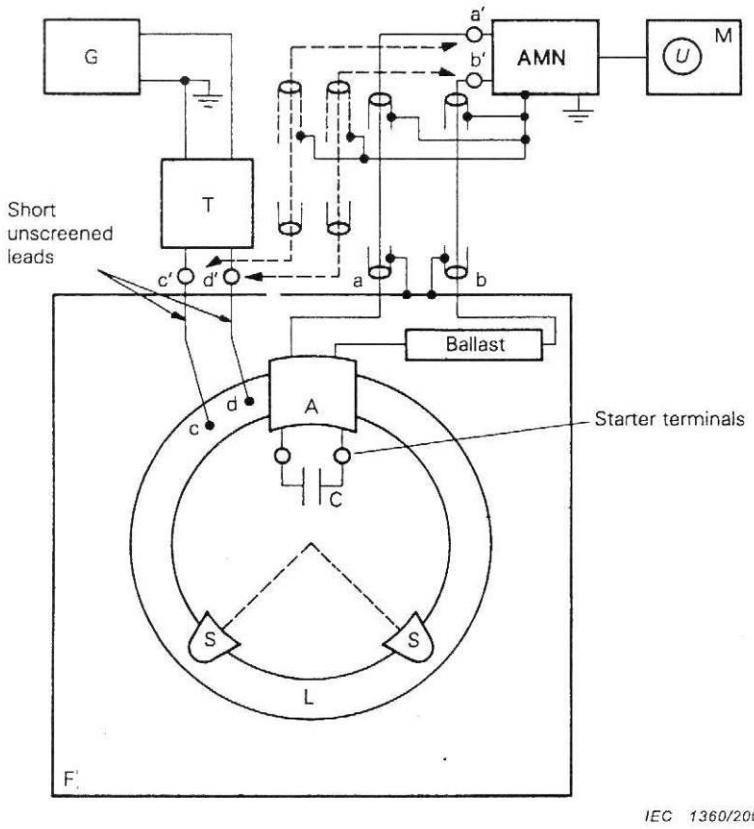


Key

G	=	r.f. generator
T	=	balance-to-unbalance transformer
AMN	=	50 Ω/50 µH + 5 Ω (or 50 Ω/50 µH) artificial mains network as specified in CISPR 16-1
M	=	r.f. millivoltmeter or measuring receiver
L	=	dummy lamp
F	=	luminaire
C	=	capacitor
a – b	=	mains terminals
a′ – b′	=	input terminals of the measuring network AMN
c – d	=	r.f. terminals of dummy lamp L
c′ – d′	=	output terminals of T
a – a′ and b – b′	=	connections by coaxial cables (Z_0 = 75 Ω), with the respective ends of the screens connected to the reference earth of AMN and F not exceeding 50 cm in length
c – c′ and d – d′	=	connections of the transformer to the dummy lamp shall be made with unscreened leads not exceeding 100 mm in length

NOTE When measuring U-type lamp luminaires, the same circuit arrangement is used, but the linear dummy lamp should be replaced by the U-type dummy lamp.

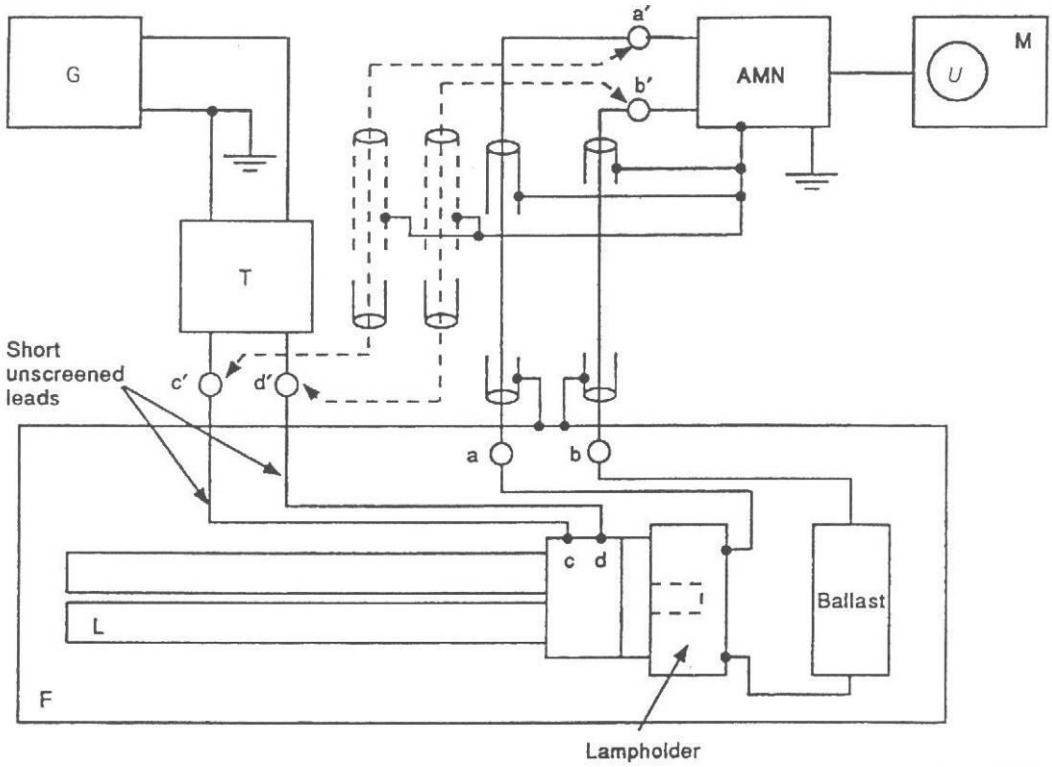
Figure 1 – Insertion loss measurement on linear and U-type fluorescent lamp luminaires



Key

G	=	r.f. generator
T	=	balance-to-unbalance transformer
AMN	=	50 Ω/50 µH + 5 Ω (or 50 Ω/50 µH) artificial mains network as specified in CISPR 16-1
M	=	r.f. millivoltmeter or measuring receiver
L	=	dummy lamp
F	=	luminaire
C	=	capacitor
A	=	lampholder
S	=	supports of insulating material
a – b	=	mains terminals
a' – b'	=	input terminals of the measuring network AMN
c – d	=	r.f. terminals of dummy lamp L
c' – d'	=	output terminals of T
a – a' and b – b'	=	connections by coaxial cables (Z_0 = 75 Ω), with the respective ends of the screens connected to the reference earth of AMN and F, not exceeding 50 cm in length
c – c' and d – d'	=	connections of the transformer to the dummy lamp shall be made with unscreened leads not exceeding 100 mm in length

Figure 2 – Insertion loss measurement on circular fluorescent lamp luminaires



Key

G	=	r.f. generator
T	=	balance-to-unbalance transformer
AMN	=	50 Ω/50 μH + 5 Ω (or 50 Ω/50 μH) artificial mains network as specified in CISPR 16-1
M	=	r.f. millivoltmeter or measuring receiver
L	=	dummy lamp
F	=	luminaire
a – b	=	mains terminals
a′ – b′	=	input terminals of the measuring network AMN
c – d	=	r.f. terminals of dummy lamp L
c′ – d′	=	output terminals of T
a – a′ and b – b′	=	connections by coaxial cables (Z_0 = 75 Ω), with the respective ends of the screens connected to the reference earth of AMN and F, not exceeding 50 cm in length
c – c′ and d – d′	=	connections of the transformer to the dummy lamp shall be made with unscreened leads not exceeding 100 mm in length

Figure 3 – Insertion loss measurement on luminaires for single-capped fluorescent lamps with integrated starter

5.3 Test Procedure

Detailed test procedure and arrangement was following clause 7.2 and clause 7.4 of EN 55015.

5.4 Test Protocol

Temperature	:	°C
Relative Humidity	:	%

5.5 Additions, Deviations and Exclusions from Standards

None.

6. Radiated emission/Conducted RF emission

Test result: **PASS**

6.1 Limit

☐ 6.1.1 Radiated emission limit from frequency range 30MHz – 300MHz

Frequency (MHz)	Permitted limit in dBμV/m (Quasi-peak) of Measurement Distance 3m	Permitted limit in dBμV/m (Quasi-peak) of Measurement Distance 10m
30-230	40	30
230-300	47	37

Notes:
1. For the measurement distance other than 3m and 10m, the limit is varied according to 20dB/10 decades.
2. The gray rows are selected items.

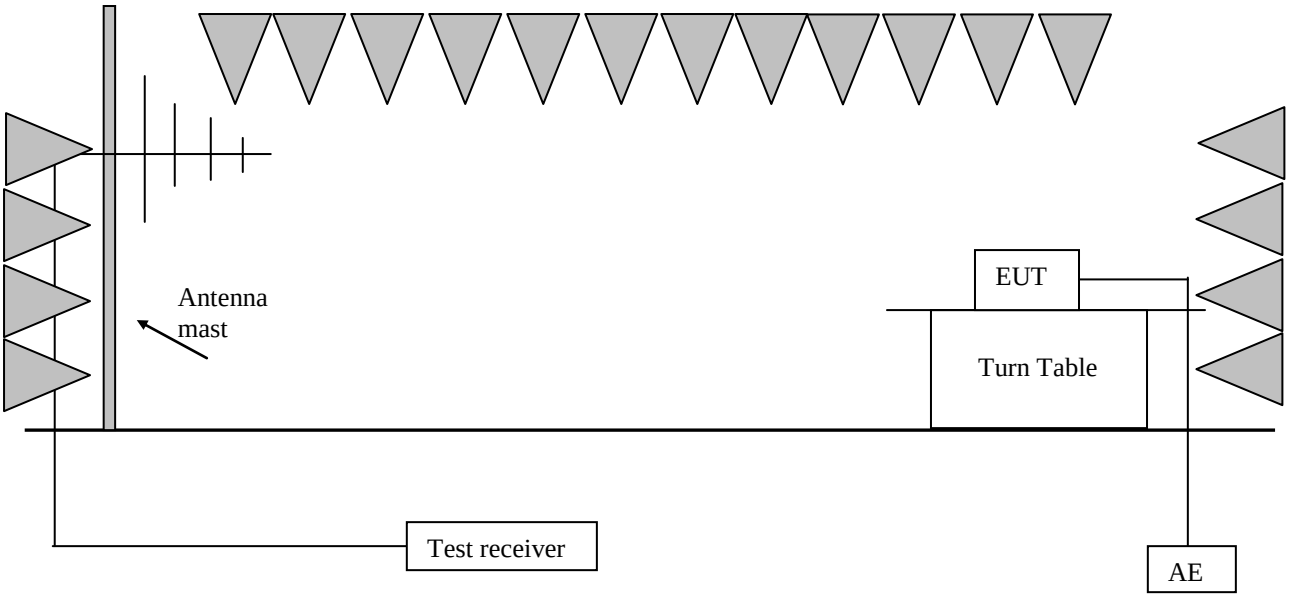
☒ 6.1.2 Common mode terminal voltage limits 30MHz – 300MHz

Frequency (MHz)	Quasi-peak limits dB(μV)
30-100	64 to 45*
100-230	54
230-300	61

Notes:
1. At the transition frequency, the lower limit applies.
2. The limit decreases linearly with the logarithm of the frequency.

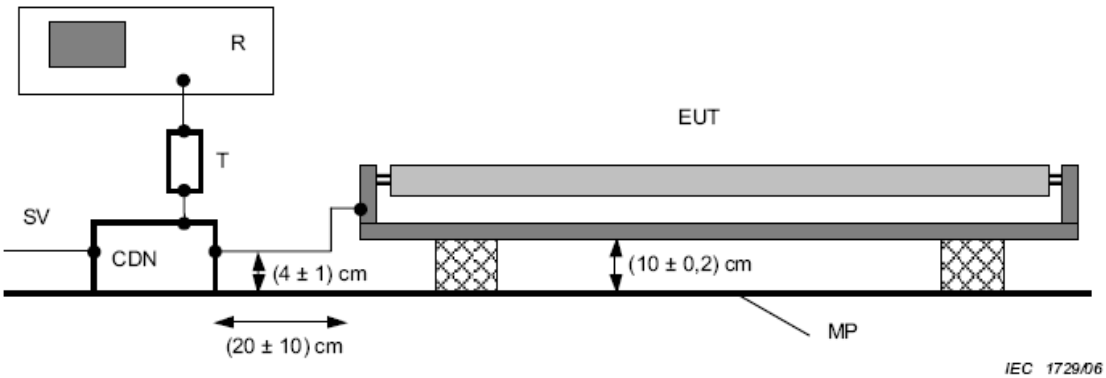
6.2 Block diagram and test set up

☐For radiated method



The measurement was applied in a semi-anechoic chamber.
Measurement was performed according to clause 10 of CISPR 22.
Setting of EUT is according to clause 9.2 & Annex C of EN 55015.
The bandwidth setting on test receiver was 120kHz.
The frequency range from 30MHz to 300MHz was checked.

☒For conducted method



Components

R	Measuring receiver	CDN	Coupling-decoupling network
SV	Supply voltage	EUT	Equipment under test
MP	Earthed metal plate	T	6 dB, 50 Ω attenuator

Measurement and setting of EUT were performed according to Annex B of EN 55015.
The frequency range from 30MHz to 300MHz was checked.

6.3 Test Protocol

Test is performed while employing:

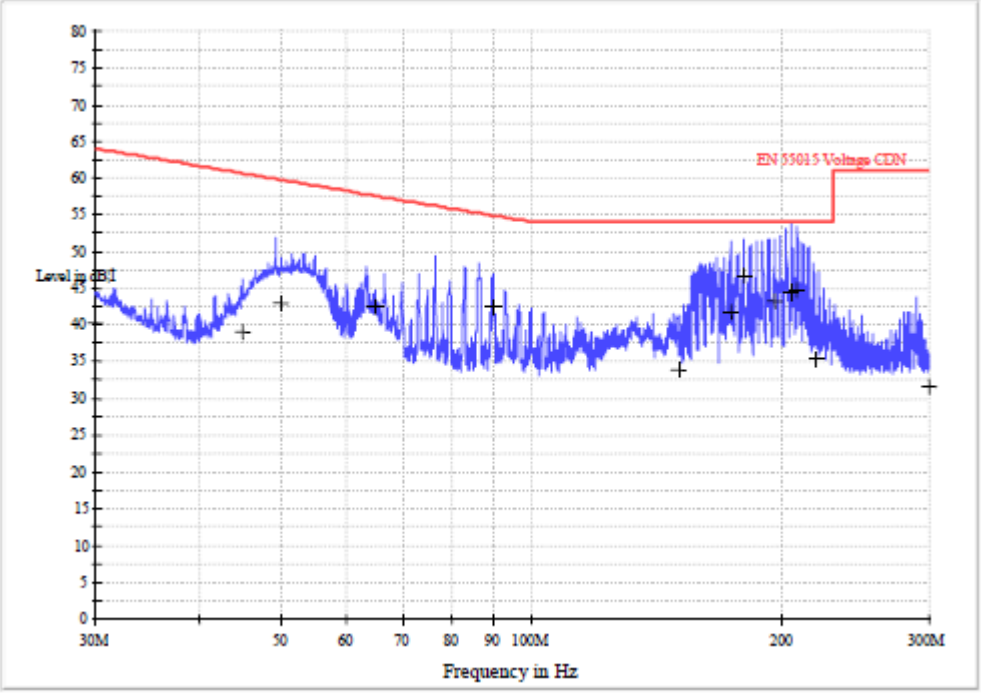
☐ Radiated method (EN 55015 Annex C)

☒ Conducted method (EN 55015 Annex B)

Temperature : 24°C

Relative humidity : 46%

For LLX-EM-TWIN-1



Frequency (MHz)	QuasiPeak (dBµV)	Margin - QPK (dB)	Limit - QPK (dBµV)
30.000000	40.26	23.74	64.00
45.000000	39.03	21.60	60.63
50.000000	42.84	16.92	59.76
65.000000	42.52	15.06	57.58
90.000000	42.53	12.35	54.88
150.000000	33.84	20.16	54.00
173.240000	41.77	12.23	54.00
180.000000	46.69	7.31	54.00
195.680000	43.32	10.68	54.00
205.160000	44.40	9.60	54.00
208.400000	44.74	9.26	54.00
220.000000	35.41	18.59	54.00
300.000000	31.61	29.39	61.00

6.4 Measurement uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.

Measurement uncertainty of radiated method/conducted method is: ± 4.90/± 3.96dB.

The measurement uncertainty is given with a confidence of 95%, k=2.

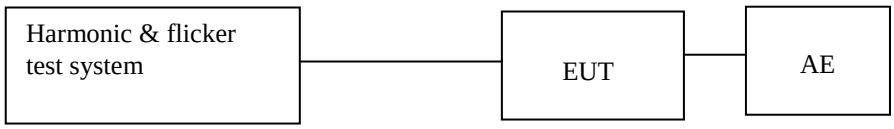
6.5 Additions, Deviations and Exclusions from Standards

None.

7. Harmonics

Test result: PASS

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

Temperature	:	23°C
Relative Humidity	:	52%

The lighting EUT has active power ＜5W, and can not be classified as discharge lighting equipments after control method checking, therefore no limit is required according to EN 61000-3-2.

7.4 Measurement Uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.

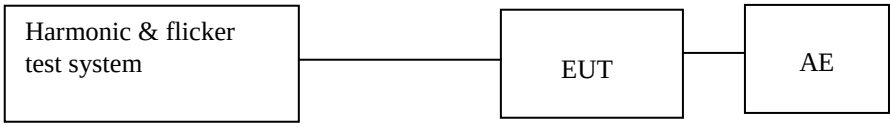
Measurement uncertainty of harmonic test is: ± 3.03%

The measurement uncertainty is given with a confidence of 95%, k=2.

8. Voltage Fluctuations-Flicker

Test result: **PASS**

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 changes during an observation period.

dmax: maximum absolute voltage changes 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.
- Tmax, 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 dmax, 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, dmax is measured in accordance with Annex B of standard, average dmax is calculated from 24 times measurement.

☒According to EN 61000-3-3 clause 6.1 & A.2, the EUT is either unlikely to produce significant voltage fluctuations/flicker or no limit and test were required by technical analysis and sample evaluation on the product.

Temperature : °C

Relative Humidity : %

8.4 Measurement Uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.
Measurement uncertainty of voltage fluctuation and flicker is: ± 11.77%.
The measurement uncertainty is given with a confidence of 95%, k=2.

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.

Basic EMC standard for immunity test
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.

9. Electrostatic Discharge (ESD)

Test result: **PASS**

9.1 Severity Level and Performance Criterion

9.1.1 Test level

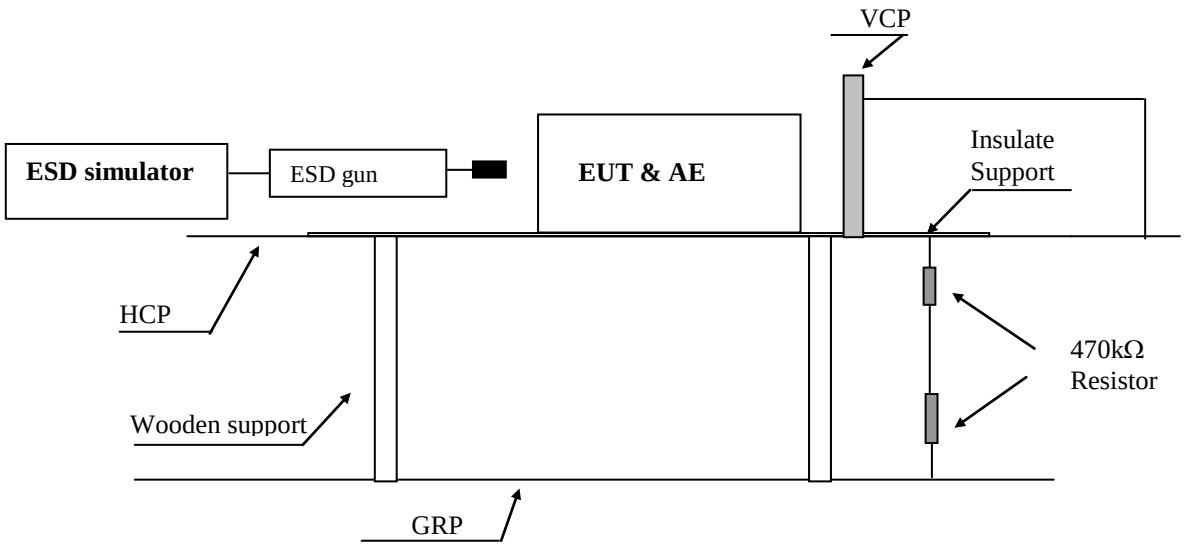
1a – Contact discharge		1b – Air discharge	
Level	Test voltage kV	Level	Test voltage kV
1	2	1	2
2	4	2	4
3	6	3	8
4	8	4	15
X	Special	X	Special
Notes: 1."X" is an open level. The level has to be specified in the dedicated equipment specification. If higher voltages than those shown are specified, special 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

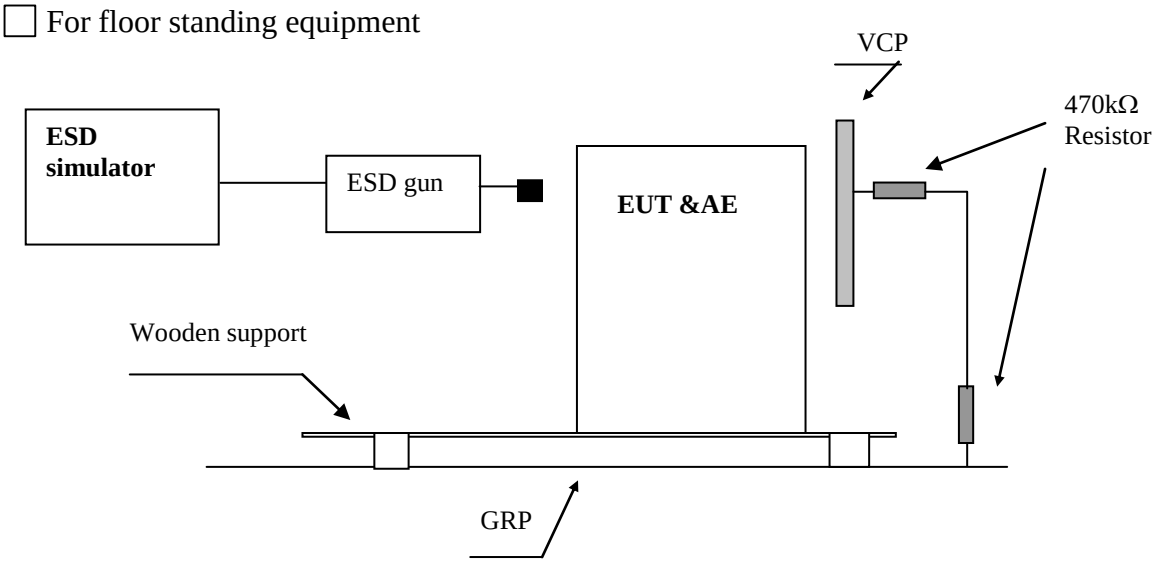
☒ For table-top equipment



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 clause 7 of IEC 61000-4-2.
The test method and equipment was specified by IEC 61000-4-2 with the modifications by clause 5.2 of EN 61547.

9.4 Test Protocol

Temperature : 23°C
Relative Humidity: 52%
Air Pressure: 100.5kPa

Direct discharges were applied at the following selected points:

Test point #	Test level [kV]	Air/ Contact	Polarity (+/-)	Result	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	Result
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	Result
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.
Conclusion: The EUT met the requirements of the standard.

9.5 Measurement Uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.

Measurement uncertainty of ESD test is: ± 6.65%

The measurement uncertainty is given with a confidence of 95%, k=2.

9.6 Additions, Deviations and Exclusions from Standards

None.

10. Electromagnetic field susceptibility

Test result: **PASS**

10.1 Severity Level and Performance Criterion

10.1.1 Test level

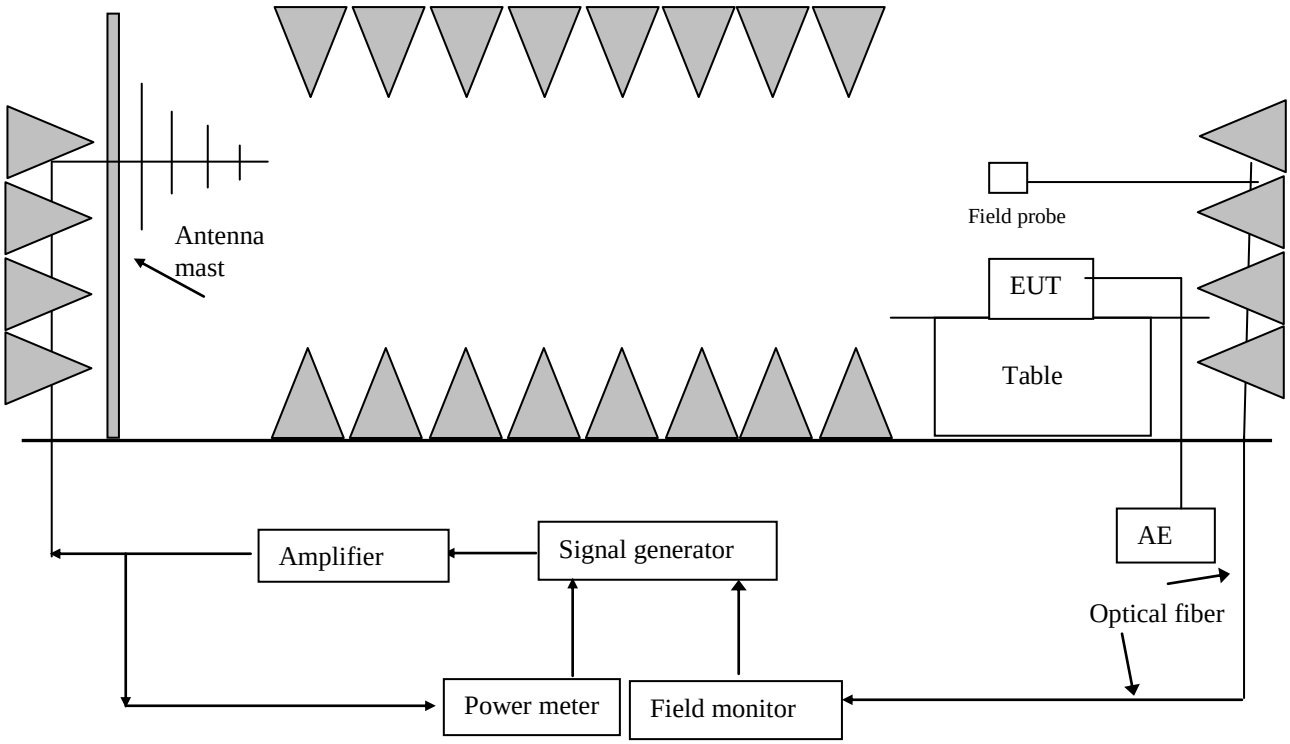
Level	Test field strength V/m
1	1
2	3
3	10
X	Special

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 clause 7 of IEC 61000-4-3.
The test method and equipment was specified by IEC 61000-4-3 with additions and modifications by clause 5.3 of EN61547.

10.4 Test Protocol

Temperature : 24°C
Relative Humidity: 48%

Test no.:	Frequency (MHz)	Polarization	Test level V/m	Modulation	Exposed location	Result	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.
Conclusion: The EUT met the requirements of standard.

10.5 Measurement Uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.

Measurement uncertainty of radiated susceptibility test is: ± 2.38dB

The measurement uncertainty is given with a confidence of 95%, k=2.

10.6 Additions, deviations and exclusions from standards

None.

11. Electric Fast Transient/Burst Immunity Test

Test result: **PASS**

11.1 Severity Level and Performance Criterion

11.1.1 Test level

Open circuit output test voltage (±10%) and repetition rate of the impulses (±20%)				
Level	On power supply ports 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.				

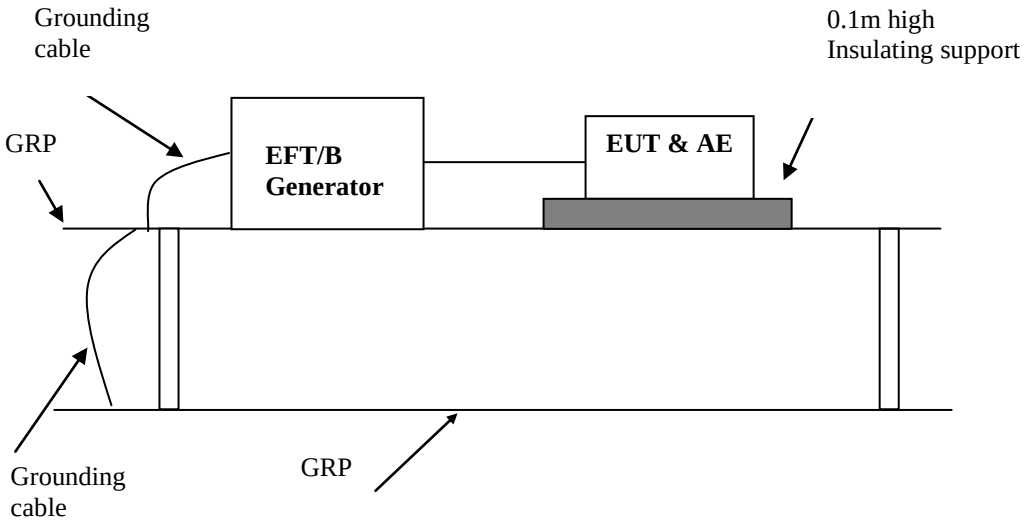
11.1.2 Performance Criterion

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.)

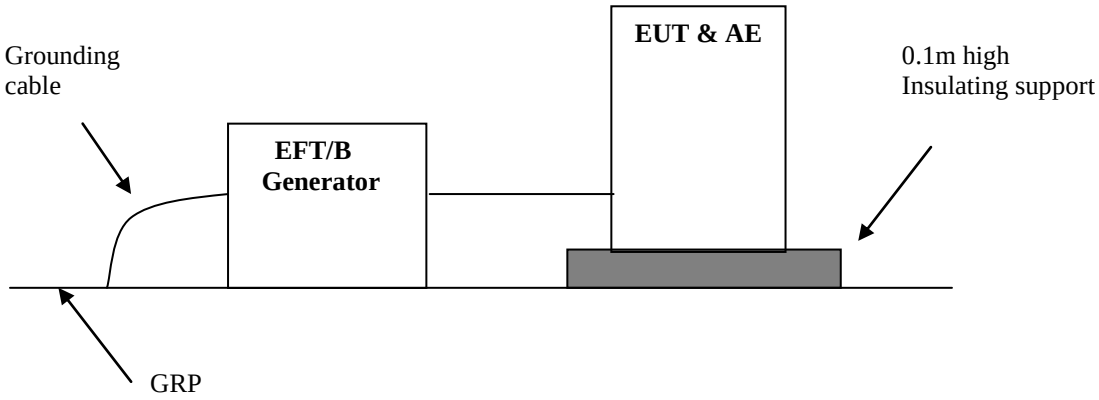
11.2 Block Diagram of Test Setup

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

☒ For table-top equipment

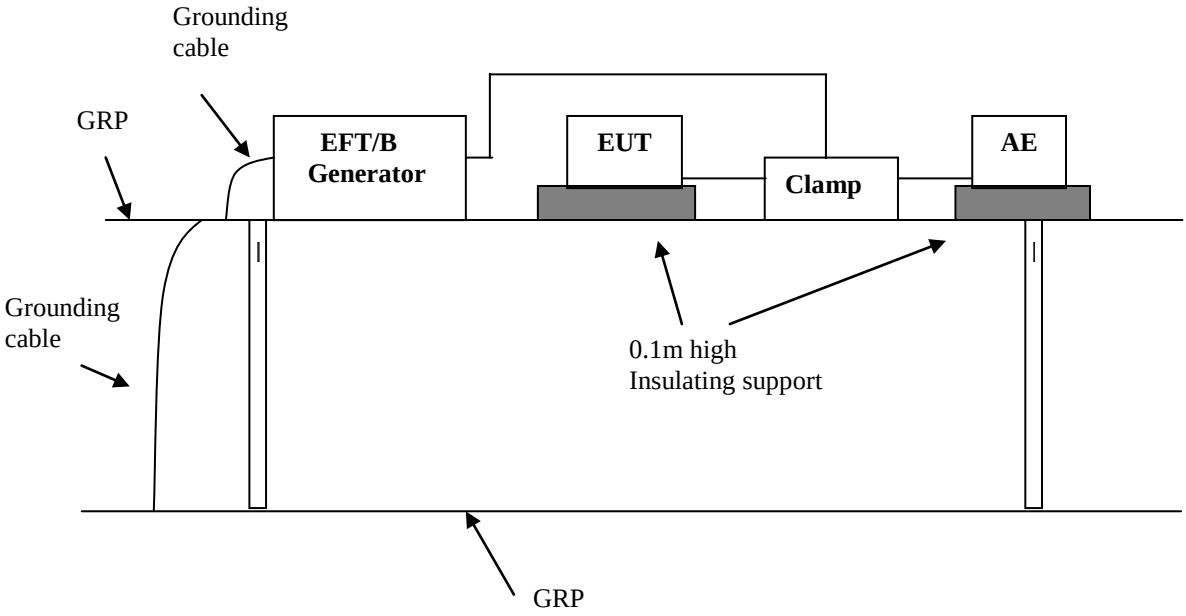


☐ For floor standing equipment

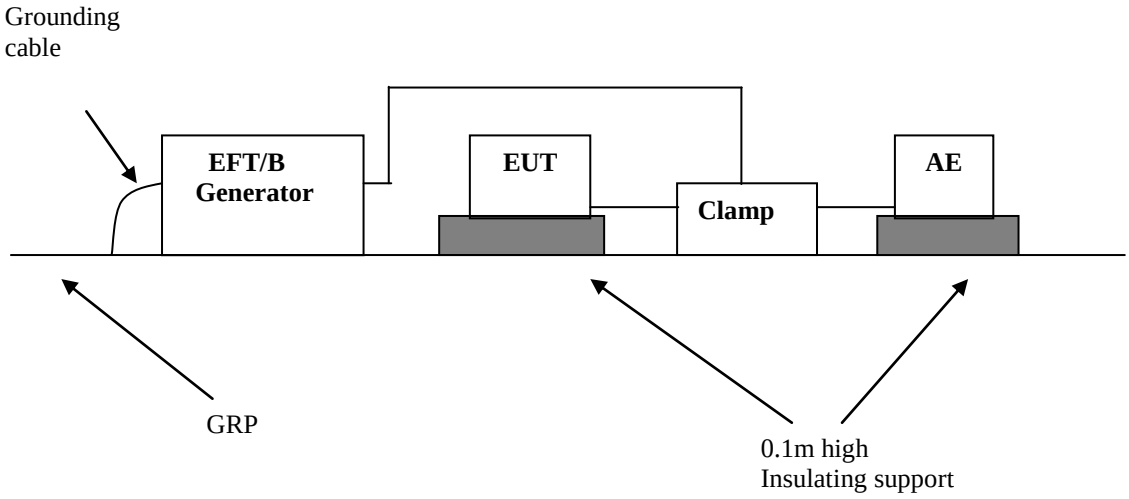


11.2.2 Block Diagram for output a.c./d.c. power line or signal/control lines

☒ 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 clause 7 of IEC 61000-4-4.

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

11.4 Test Protocol

Temperature : 24°C
Relative Humidity: 48%

Test No.	Level [kV]	Polarity +/-	Repetition rate kHz	Line for test	Pass/ Fail
1	0.5	+/-	5	Signal lines and control lines	NA
2	0.5	+/-	5	d.c. power ports	NA
3	1	+/-	5	a.c. power ports	Pass
Notes: "NA" means not applicable.					

Observation: All the functions were operated as normal during and after test.
Conclusion: The EUT met the requirements of the standard.

11.5 Measurement Uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.
Measurement uncertainty of EFT test at main terminal is: ± 18.33%
Measurement uncertainty of EFT test at signal/telecom terminal is: ± 18.36%
The measurement uncertainty is given with a confidence of 95%, k=2.

11.6 Additions, Deviations and Exclusions from Standards

None.

12. Surge Immunity Test

Test result: **PASS**

12.1 Severity Level and Performance Criterion

12.1.1 Test level

Level	Open-circuit test voltage ±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

12.2.1 Block Diagram for input a.c. power line



12.3 Test Setup and Test Procedure

Measurement was performed in shielded room.
Measurement and setting of EUT was applied according to clause 7 of IEC 61000-4-5.
The test method and equipment was specified by IEC 61000-4-5 with modifications by clause 5.7 of EN 61547.

12.4 Test Protocol

Temperature : 25°C
Relative Humidity: 51%

Test No.	Level [kV]	Polarity +/-	Angle	Line for test	Pass/ Fail
1	0.5	+	90 º	a.c. Mains (line to line)	Pass
2	0.5	-	270 º	a.c. Mains (line to line)	Pass
3	1	+	90 º	a.c. Mains (line to earth)	NA
4	1	-	270 º	a.c. Mains (line to earth)	NA
5	1	+	90 º	a.c. Mains (line to line)	NA
6	1	-	270 º	a.c. Mains (line to line)	NA
7	2	+	90 º	a.c. Mains (line to earth)	NA
8	2	-	270 º	a.c. Mains (line to earth)	NA
Notes: 1. "NA" means not applicable.					

Observation: During test, the light has some flashing. Once the interference is removed, it recovered its normal mode.

Conclusion: The EUT met the requirements of the standard.

12.5 Measurement Uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.

Measurement uncertainty of surge test at main terminal is: ±11.57%.

The measurement uncertainty is given with a confidence of 95%, k=2.

12.6 Additions, Deviations and Exclusions from Standards

None.

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

Test result: **PASS**

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.		

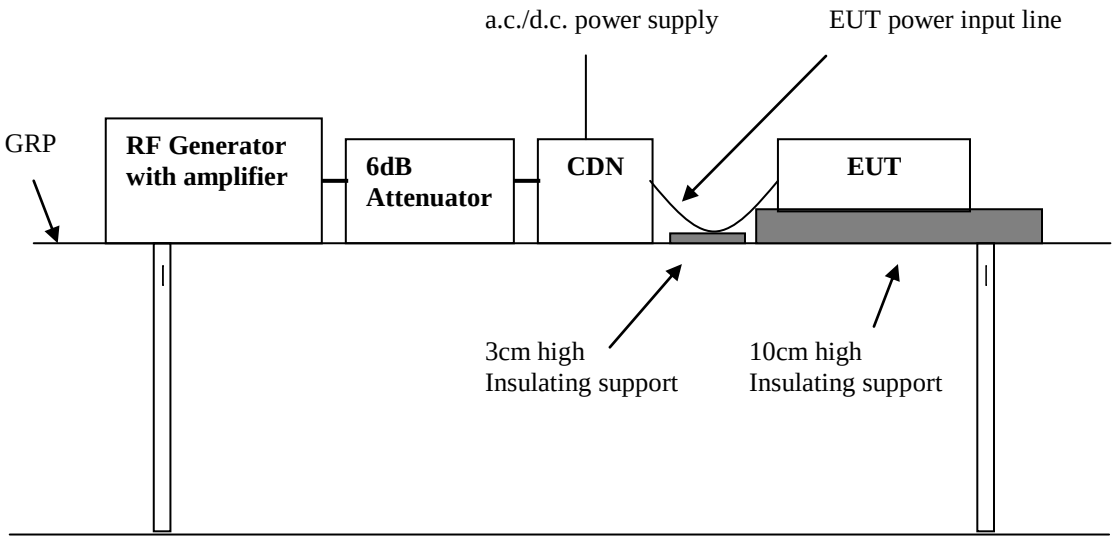
13.1.2 Performance Criterion

Performance criterion **A**

13.2 Block Diagram of Test Setup

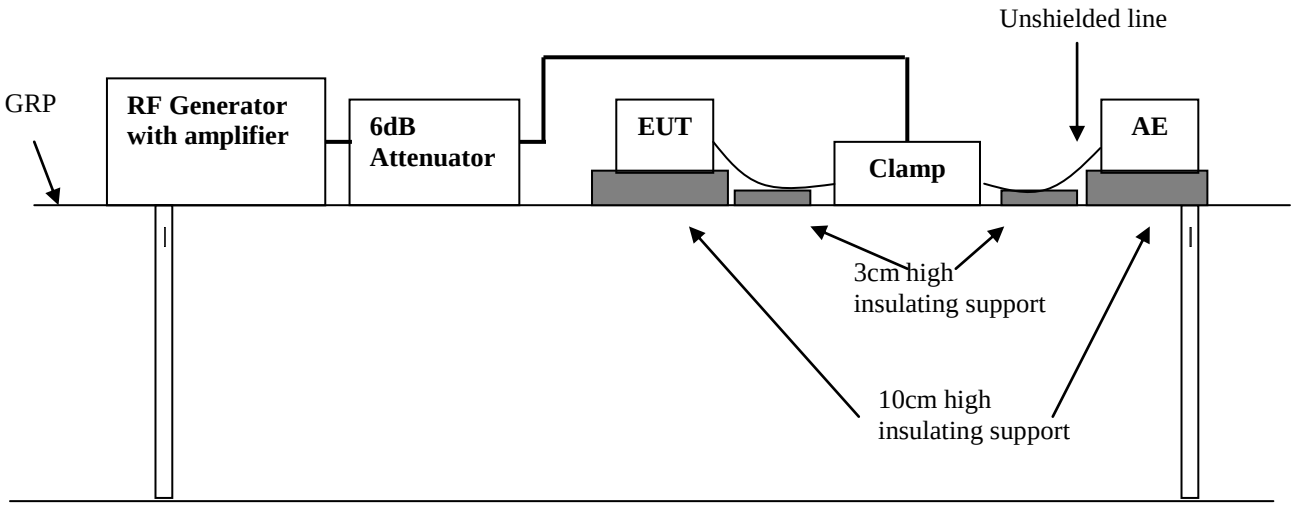
13.2.1 Block Diagram for a.c./d.c. input power line

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

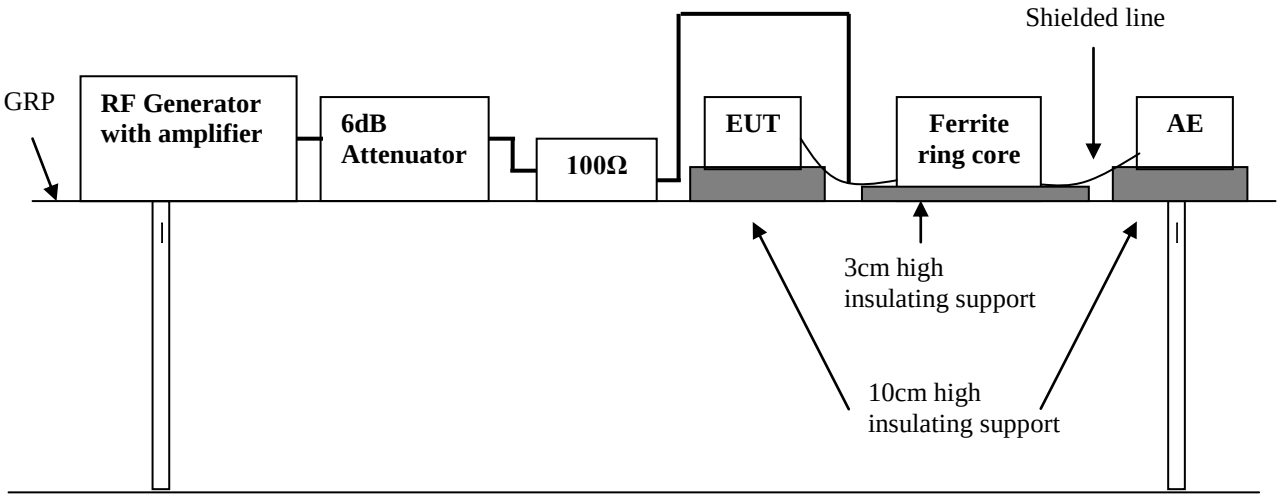


13.2.2 Block Diagram for output a.c./d.c. power line or signal/control lines

☐ 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 clause 7 of IEC 61000-4-6.

The test method and equipment was specified by IEC 61000-4-6 with additions and modifications by clause 5.6 of EN61547.

13.4 Test Protocol

Temperature : 25°C
Relative Humidity: 51%

Test No.	Frequency (MHz)	Level V (r.m.s.)	Modulation	Injected point	Result
1	0.15~80	3	1kHz, 80%, SW, AM, 1% step size	a.c. Mains	Pass
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	-
Note: "NA" means not applicable.					

Observation: All the functions were operated as normal during and after test.
Conclusion: The EUT met the requirements of the standard.

13.5 Measurement Uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.
Measurement uncertainty of injected current test at main terminal is ± 2.59dB.
Measurement uncertainty of injected current test at unshielded signal terminal is ± 3.01dB.
Measurement uncertainty of injected current test at shielded signal terminal is under consideration.
The measurement uncertainty is given with a confidence of 95%, k=2.

13.6 Additions, Deviations and Exclusions from Standards

None.

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

Test result: **PASS**

☐ As luminaire for emergency lighting, these tests do not apply as they are covered by the test in IEC 60598-2-22.

14.1 Severity Level and Performance Criterion

14.1.1 Test level

Test level % U_T	Voltage dip and short interruptions % U_T	Duration (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.

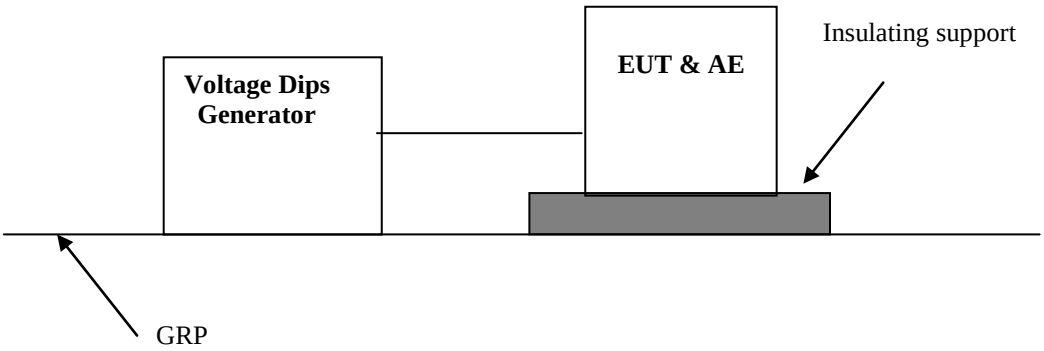
4. The gray rows are selected test level.

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 clause 7 of IEC 61000-4-11.
The test method and equipment was specified by IEC 61000-4-11 with additions and modifications by clause 5.8 of EN 61547.

14.4 Test Protocol

Temperature : 25 °C
Relative Humidity: 51 %

Test no.	Test level % U_T	Voltage dip and short interruptions % U_T	Duration (in periods)	Result	Comment
1	70	30%	10 cycles	Pass	-
2	0	100% pos half cycle	0,5 cycle	Pass	-
3	0	100% neg half cycle	0,5 cycle	Pass	-

Observation: At test level of 70%, the EUT worked unsteadily. Once the interference is removed, it recovered its normal mode at once.
Conclusion: The EUT met the requirements of the standard.

14.5 Measurement Uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT.
Measurement uncertainty of voltage dips and interruption test is: ±11.57%.
The measurement uncertainty is given with a confidence of 95%, k=2.

14.6 Additions, deviations and exclusions from standards

None.

Appendix I: photograph

Overview

