



TEST REPORT Electromagnetic compatibility Requirements for general lighting purposes equipment	
Report Reference No.	378300TRFEMC
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Approved by (name, function and signature)	D. Guarnone (verifier) 
Date of issue	2019-10-01
Testing Laboratory	Nemko Spa
Address	Via del Carroccio, 4 – 20853 Biassono (MB) – Italy
Testing location	Nemko Spa
Address	Via del Carroccio, 4 – 20853 Biassono (MB) – Italy
Applicant's name	C Luce Srl
Address	Via Marmolada 5/11 – 20060 Truccazzano (MI) – Italy
Test specification:	
Standard	EN 55015 (2013) – EN 61547 (2009) EN 61000-3-2 (2014) – EN 61000-3-3 (2013)
	Full application of the standards <input checked="" type="checkbox"/>
	Partial application of the standards <input type="checkbox"/>
Test procedure	Nemko WM L0077, WM L0177 and WM L1002
Test Report Form No.	55015TRFEMC
TRF Originator	Nemko Spa
Master TRF	2014-02
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Test item description	
Trade Mark	
Manufacturer	C Luce Srl.
Address of manufacturer	Via Marmolada 5/11 – 20060 Truccazzano (MI) – Italy
Model	SKYLINE 506643.416
Ratings	220-240 VAC, 50-60 Hz, 140 W 700 mA

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 The phase of sampling / collection of equipment under test is carried out by the customer.

Test Report No. :	378300TRFEMC	2019-10-01
		Date of issue

Short description of the EuT	Copy of marking plate
<p>The EUT is a LED light provided by 64 LED with multiple cluster in PMMA road lens and asymmetrical vertex at 30°.</p> <p>The equipment is powered by dimmable constant current LED driver Philips Xitanium 150W 0.70A 1-10V 230VS240.</p>	
Number of tested samples:	1
Serial number:	378300/2 (number assigned by Nemko Spa)
Lighting equipment type:	LED luminaire
Mounting system:	Pole mounting
Accessories and detachable parts included:	The E.U.T. is composed by one unit
Other options included:	-
Testing	
Date of receipt of test sample:	2019-09-25
Testing commenced on:	2019-09-26
Testing concluded on:	2019-09-30
Possible test case verdicts:	
test case does not apply to the test object:	N (Not applicable)
test object does meet the requirement:	P (Pass)
test object does not meet the requirement:	F (Fail)
Symbols used in this test report	
<input checked="" type="checkbox"/> The crossed square indicates that the listed condition or equipment is applicable for this report.	
<input type="checkbox"/> The empty square indicates that the listed condition or equipment is not applicable for this report.	
Throughout this report point is used as decimal separator.	
The results contained in this report reflect the results for this particular model and serial number. It is the responsibility of the manufacturer to ensure that all production models meet the intent of the requirements detailed within this report.	

Verdict according to the standards listed at page 5:	Pass
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PROJECT HISTORY		
Report number	Modification to the report / comments	Date
378300TRFEMC	First release	2019-10-01
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REMARKS		

PRODUCT VARIANTS		
Variant model	Difference against the main model	Additional test performed
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REMARKS		

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1 TEST STANDARDS

The tests were performed according to following standards and procedures.

NEMKO WM L0177: General routines for using instruments at Nemko

NEMKO WM L1002: Measurement Uncertainty - Policy and Statement

NEMKO WM L0077: General routines to perform EMC tests

EN 55015 (2013)

Limits and methods of measurement of radio disturbance characteristics of electrical lighting and similar equipment

EN 61547 (2009)

Equipment for general lighting purposes – EMC immunity requirements

EN 61000-3-2 (2014)

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

EN 61000-3-3 (2013)

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 ≤ 16 A per phase and not subject to conditional connection

The main standard(s) above contain(s) references to other standards, which are listed below.

EN 61000-4-2 (2009)

Electromagnetic compatibility (EMC) -- Part 4-2: Testing and measurement techniques - Electrostatic discharge immunity test

EN 61000-4-3 (2006) + A1 (2008) + IS1 (2009)

Electromagnetic compatibility (EMC) -- Part 4-3: Testing and measurement techniques - Radiated, radio-frequency, electromagnetic field immunity test

EN 61000-4-4 (2004)

Electromagnetic compatibility (EMC) -- Part 4-4: Testing and measurement techniques - Electrical fast transient/burst immunity test

EN 61000-4-5 (2006)

Electromagnetic compatibility (EMC) -- Part 4-5: Testing and measurement techniques - Surge immunity test

EN 61000-4-6 (2009)

Electromagnetic compatibility (EMC) -- Part 4-6: Testing and measurement techniques - Immunity to conducted disturbances, induced by radio-frequency fields

EN 61000-4-8 (1993) + A1 (2001)

Electromagnetic compatibility (EMC) -- Part 4-8: Testing and measurement techniques - Power frequency magnetic field immunity test

EN 61000-4-11 (2004)

Electromagnetic compatibility (EMC) -- Part 4-11: Testing and measurement techniques - Voltage dips, short interruptions and voltage variations immunity tests

2 SUMMARY OF TEST RESULTS

Emission		
Requirement – Test	Frequency range	Verdict
Radiated disturbance in the frequency range 30 MHz to 300 MHz	30 MHz to 300 MHz	P
Radiated disturbances in the frequency range 9 kHz to 30 MHz	9 kHz to 30 MHz	P
Disturbance voltages in the frequency range 9 kHz to 30 MHz	9 kHz to 30 MHz	P
Insertion Loss	150 kHz to 1605 kHz	N
Harmonic current emissions	0 kHz – 2 kHz	P
Voltage changes, voltage fluctuations and flicker	50 Hz	P
Immunity		
Requirement - Test	Ref standard	Verdict
Electrostatic discharges	EN 61000-4-2	P
Radio-frequency electromagnetic fields	EN 61000-4-3	P
Fast transients – Signal and control lines	EN 61000-4-4	N
Fast transients – I/O DC power ports	EN 61000-4-4	N
Fast transients – I/O AC power ports	EN 61000-4-4	P
Surges – Input AC power ports	EN 61000-4-5	P
Injected currents – Signal and control lines	EN 61000-4-6	N
Injected currents – I/O DC power ports	EN 61000-4-6	N
Injected currents – I/O AC power ports	EN 61000-4-6	P
Power frequency magnetic fields	EN 61000-4-8	P
Voltage dips – Input AC power ports	EN 61000-4-11	P
Voltage interruptions – Input AC power ports	EN 61000-4-11	P
GENERAL REMARKS		

3 EQUIPMENT UNDER TEST

3.1 Power supply system utilised

Power supply voltage:	<input checked="" type="checkbox"/>	230V/50 Hz / 1 ϕ	<input type="checkbox"/>	115V/60Hz / 1 ϕ
	<input type="checkbox"/>	400V/50 Hz 3PE	<input type="checkbox"/>	400V/50 Hz 3NPE
	<input type="checkbox"/>	12 VDC	<input type="checkbox"/>	24 VDC

3.2 EuT operation modes

Mode	Description
1	Normal working

3.3 EuT configuration modes

Emission: the EuT was configured to measure its highest possible radiation level. The test modes selected are according to EuT instruction manual.

Immunity: the EuT was configured to have its highest possible susceptibility against tested phenomena. The test modes selected are according to EuT instruction manual.

Mode	Description
1	The EUT has been tested connected to the mains

3.4 Input/Output Ports

Port	Name	Type*	Cable Max. >3m	Cable Shielded	Description
0	Enclosure	N/E	—	—	—
1	Mains	AC	<input type="checkbox"/>	<input type="checkbox"/>	Three wires cable

*Note:

AC = AC Power Port

DC = DC Power Port

N/E = Non-Electrical

I/O = Signal/Control Input or Output Port

TP = Telecommunication Ports

3.5 Equipment Used During Test

Use*	Product Type	Manufacturer	Model	Comments
—	—	—	—	—
Note: * Use EUT - Equipment Under Test AE - Auxiliary/Associated Equipment (Not Subjected to Test) SIM - Simulator (Not Subjected to Test)				

3.6 Performance level

The test results shall be classified in terms of the loss of function or degradation of performance of the equipment under test, relative to a performance level defined by its manufacturer or the requestor of the test, or agreed between the manufacturer and the purchaser of the product.

Definition related to the performance level:

<input checked="" type="checkbox"/>	based on the used product standard
<input type="checkbox"/>	based on the declaration of the manufacturer, requestor or purchaser

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.

Representative parameter	Acceptable level of performance
A change of luminous intensity	Checked by visual observation

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.

Representative parameter	Acceptable level of performance
A change of luminous intensity	Checked by visual observation

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.

Representative parameter	Acceptable level of performance
A change of luminous intensity	Checked by visual observation

4 TEST ENVIRONMENT

4.1 Address of the test laboratory

Nemko Spa
Via del Carroccio, 4
20853 Biassono (MB) - Italy

Tests site/benches are in accordance with applicable standard/s, and have been utilized by Nemko Spa testing engineer(s).

4.2 Environmental conditions

Unless different values are declared in the test case, following ambient conditions apply for the tests:

Ambient temperature:	<u>18÷33 °C</u>
Relative Humidity:	<u>30÷60 %</u>
Atmospheric pressure:	<u>980÷1060 hPa</u>

4.3 Test equipment used for the monitoring of the environmental conditions

Equipment	Manufacturer	Model	Serial N°
Thermohygrometer data loggers	Testo	175-H2	20012380/305
Thermohygrometer data loggers	Testo	175-H2	38203337/703
Barometer	MSR	MSR145B	330080

4.4 Statement of the measurement uncertainty

The data and results referenced in this document are true and accurate. The reader is cautioned that there may be errors within the calibration limits of the equipment and facilities. The measurement uncertainty was calculated for all measurements listed in this test report according to CISPR 16-4-2 "Specification for radio disturbance and immunity measuring apparatus and methods – Part 4-2: Uncertainties, statistics and limit modelling – Uncertainty in EMC measurements" and is documented in the Nemko Spa Technical Procedure WML1002. Furthermore, component and process variability of devices similar to that tested may result in additional deviation. The manufacturer has the sole responsibility of continued compliance of the device. Hereafter the best measurement capability for Nemko Spa laboratory is reported:

Test	Range	Measurement Uncertainty	Notes
Radiated Disturbance 3m, 10m Chamber	Antenna distance 1m, 3m, 10m (30÷200) MHz	5.0 dB	(1)
	Antenna distance 1m, 3m, 10m (0.2÷6) GHz	5.2 dB	(1)
	Antenna distance 1m, 3m (6÷18) GHz	5.8 dB	(1)
	Antenna distance 1m, 3m (18÷40) GHz	7.2 dB	(1)

Test	Range	Measurement Uncertainty	Notes
Conducted Disturbance	9 kHz ÷ 150 kHz with AMN	3.8 dB	(1)
	150 kHz ÷ 30 MHz with AMN	3.4 dB	(1)
	150 kHz ÷ 30 MHz with AAN	4.6 dB	(1)
	9 kHz ÷ 30 MHz with voltage probe	2.9 dB	(1)
	9 kHz ÷ 30 MHz with current probe	2.9 dB	(1)
Clicks	9 kHz ÷ 150 kHz	3.8 dB	(1)
	150 kHz ÷ 30 MHz	3.4 dB	(1)
Disturbance Power	30 MHz ÷ 300 MHz	4.5 dB	(1)
Frequency	10 Hz ÷ 1 kHz	0.2%	(1)
	1 kHz ÷ 40 GHz	10-6	(1)
Harmonic Current Emission	50 Hz ÷ 2 kHz	2%	(1)
Voltage Fluctuation Emission	--	2%	(1)
Radiated Immunity 10m, 3m chambers	20 MHz ÷ 6 GHz	3.4 dB	(1)
Radiated Immunity TEM Cell	(0.01÷200) MHz	3.0 dB	(1)
Bulk Current	(1÷200) MHz	3.0 dB	(1)
Conducted RF Immunity	9 kHz ÷ 230 MHz	3.0 dB	(1)
ESD Immunity	Voltage, Current, Rise time, Duration	(2)	(1)
Burst Immunity	Voltage, frequency, burst period and duration, rise time and pulse width	(2)	(1)
Surge Immunity	Voltage, Current, Rise time, Duration	(2)	(1)
Dips Immunity	Amplitude	5%	(1)
	Duration	5%	
Magnetic Field Immunity	50 Hz	2.0dB	(1)
Damped Magnetic Field Immunity	100 kHz, 1 MHz	3 dB ampl. 10% freq.	(1)
Oscillatory Wave Immunity	Voltage, front time, frequency 100 kHz, 1 MHz	(2)	(1)
Low Frequency Immunity	15 Hz ÷ 150 kHz	2.2 dB	(1)
Automotive transients Immunity	Voltage, rise time, duration time Impulses 1, 2a, 2b, 3a, 3b and 4	(2)	(1)
Automotive transients Emission	Amplitude	10%	(1)
	Time	10%	
EMF	Lighting Equipment	26%	(1)
	Other Equipment	20%	

NOTES:

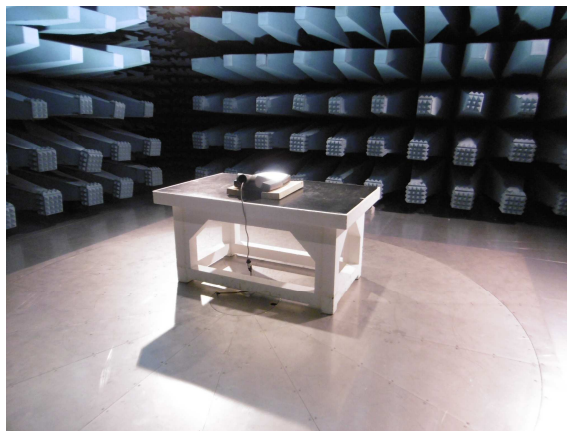
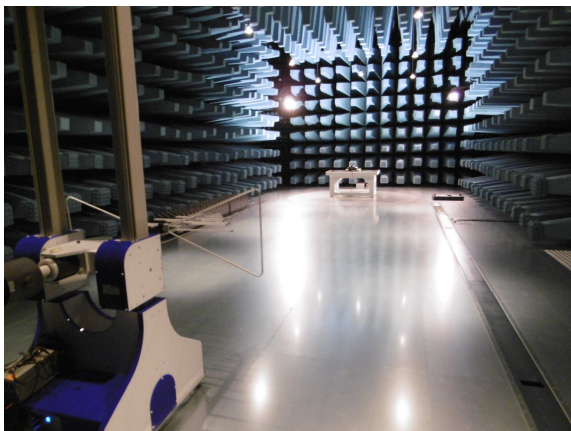
(1) The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k = 2$ which has been derived from the assumed normal probability distribution with infinite degrees of freedom and for a coverage probability of 95 %;

(2) The instruments used for this immunity test is according to the tolerances requested by the applicable standard

5 TEST CONDITIONS AND RESULTS

5.1 Radiated disturbance in the frequency range 30 MHz to 300 MHz

5.1.1 Photo documentation of the test set-up



5.1.2 Test method

Measurements were made on a semi anechoic chamber. Preliminary (peak) measurements were performed at an antenna to EUT separation distance of 10 meters with the receiving antenna located at a fixed height (from 1 to 4 meter) in both horizontal and vertical polarities. Final measurements (quasi-peak) were then performed by rotating the EUT 360° and adjusting the receiving antenna height from 1 to 4 meters. All frequencies were investigated in both horizontal and vertical antenna polarity, where applicable.

5.1.3 Limits

Frequency (MHz)	Limit (dBμV/m) - Quasi-Peak
30 TO 230	30
230 TO 300	37

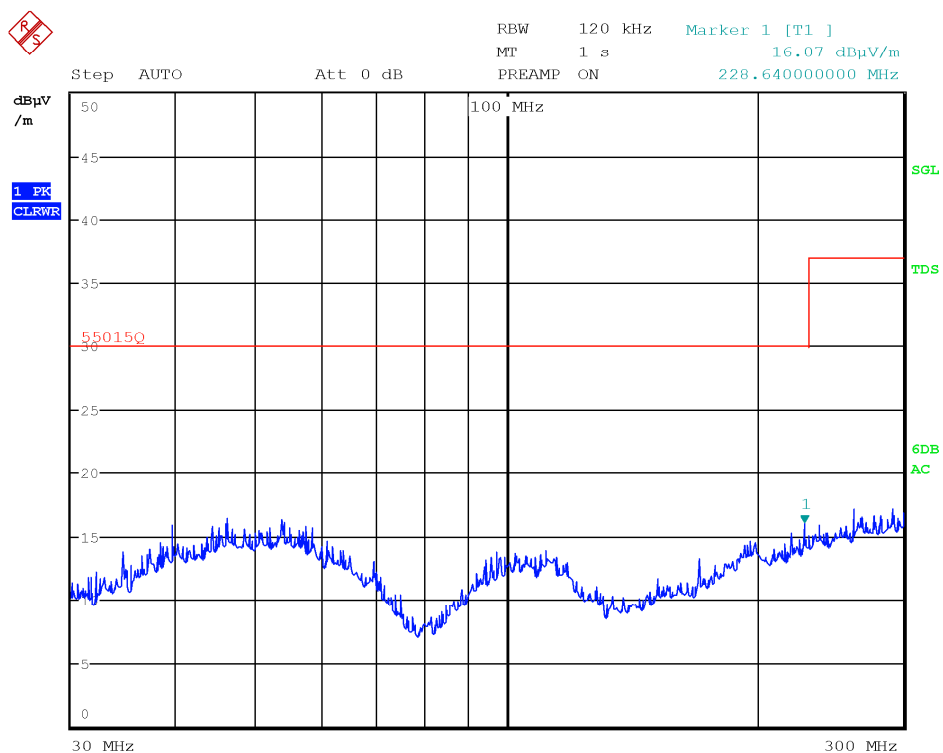
5.1.4 Test result

Verdict:	<input checked="" type="checkbox"/> P <input type="checkbox"/> F <input type="checkbox"/> N
Frequency range:	30 MHz – 300 MHz
Kind of test site:	Semi anechoic chamber
Measurement distance:	10 m
Remarks:	

5.1.5 Test protocol

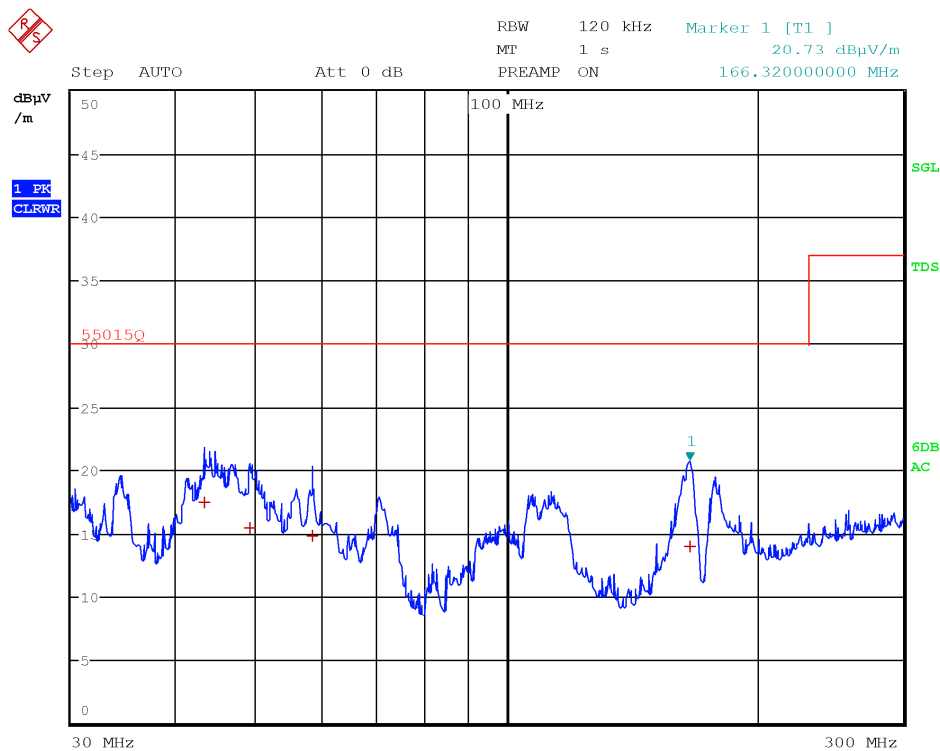
Antenna polarization: Horizontal
 Operation mode: 1
 Configuration mode: 1
 Remarks: -

Verdict: Pass



Antenna polarization: Vertical
 Operation mode: 1
 Configuration mode: 1
 Remarks: -

Verdict: Pass



Frequency (MHz)	Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Detector
43.4000	17.6	30.0	-12.4	QP
49.1600	15.5	30.0	-14.5	QP
58.4800	15.0	30.0	-15.0	QP
166.3200	14.1	30.0	-15.9	QP

5.1.6 Test equipment used

Equipment	Manufacturer	Model	Serial No.
Trilog Broadband Antenna (25 ÷ 8000 MHz)	Schwarzbeck	VULB 9162	9162-025
EMI receiver (20 Hz ÷ 8 GHz)	R&S	ESU8	100202
Turntable 4,5t	Maturo	TT4.0-5T	2.527
Tilt antenna mast	Maturo	TAM4.0-E	10042
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530
Shielded room	Siemens	10m control room	1947

5.2 Radiated disturbance in the frequency range 9 kHz to 30 MHz

5.2.1 Photo documentation of the test set-up



5.2.2 Test method

The quasi-peak limits of the magnetic component of the radiated disturbance field strength in the frequency range 9 kHz to 30 MHz, measured as a current in 2 m, 3 m or 4 m loop antennas around the lighting equipment.

5.2.3 Limits

Frequency (MHz)	Limit (dBμA) - Quasi-Peak		
	2 m	3 m	4 m
0.009 TO 0.07	88	81	75
0.07 TO 0.15	88 TO 58*	81 TO 51*	75 TO 45*
0.15 TO 3.0	58 TO 22*	51 TO 15*	45 TO 9*
3.0 TO 30	22	15 TO 16**	9 TO 12**

*The limits decrease linearly with the logarithm of the frequency

**The limits increase linearly with the logarithm of the frequency

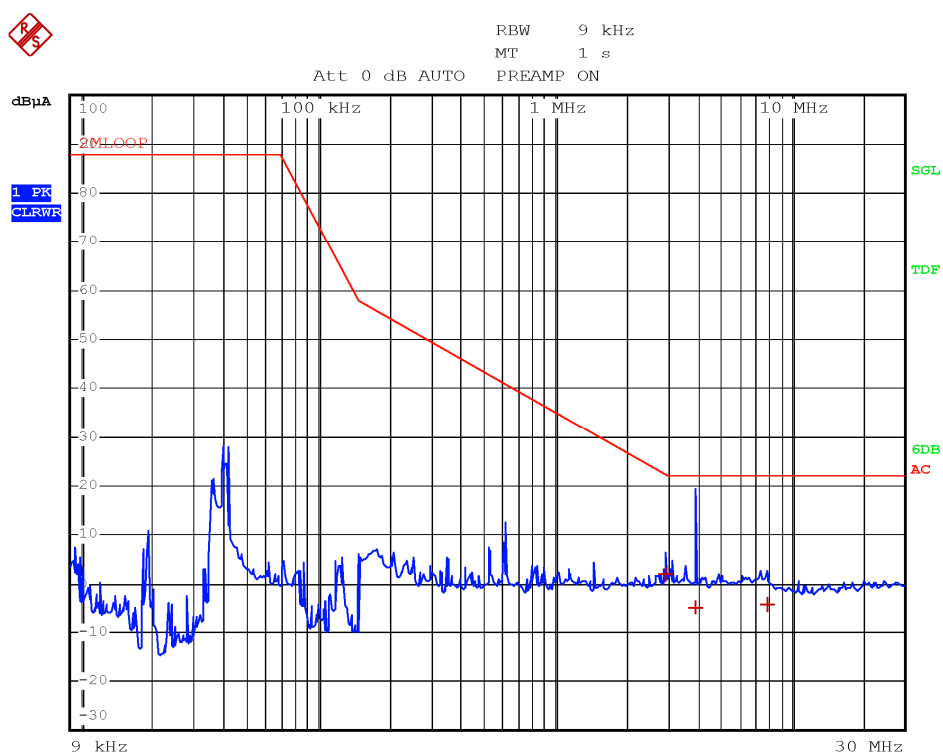
5.2.4 Test result

Verdict:	<input checked="" type="checkbox"/> P <input type="checkbox"/> F <input type="checkbox"/> N
Frequency range:	0.009 MHz – 30 MHz
Kind of test site:	Laboratory
Remarks:	

5.2.5 Test protocol

Antenna polarization: Axis 1
 Operation mode: 1
 Configuration mode: 1
 Remarks: -

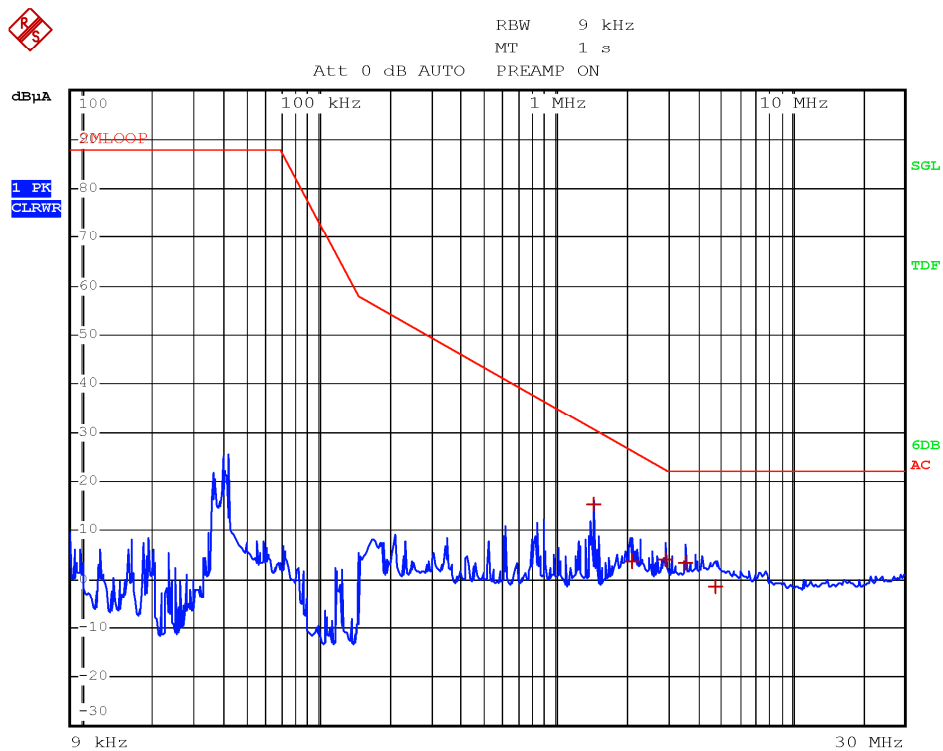
Verdict: Pass



Frequency (MHz)	Level (dBμA/m)	Limit (dBμA/m)	Margin (dB)	Detector
2.9300	1.8	22.3	-20.5	QP
3.9220	-4.9	22.0	-26.8	QP
7.9260	-4.3	22.0	-26.2	QP

Antenna polarization: Axis 2
 Operation mode: 1
 Configuration mode: 1
 Remarks: -

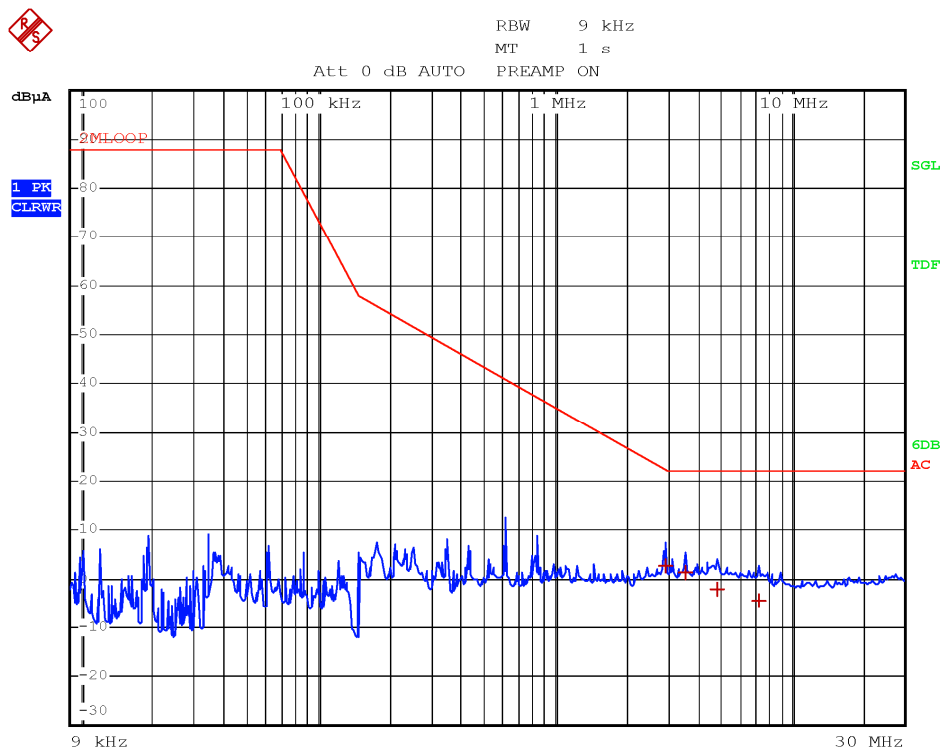
Verdict: Pass



Frequency (MHz)	Level (dBμA/m)	Limit (dBμA/m)	Margin (dB)	Detector
1.4660	15.2	30.6	-15.4	QP
2.1260	3.6	26.1	-22.5	QP
2.9300	3.8	22.3	-18.4	QP
3.5580	3.3	22.0	-18.7	QP
4.7860	-1.5	22.0	-23.4	QP

Antenna polarization: Axis 3
Operation mode: 1
Configuration mode: 1
Remarks: -

Verdict: Pass



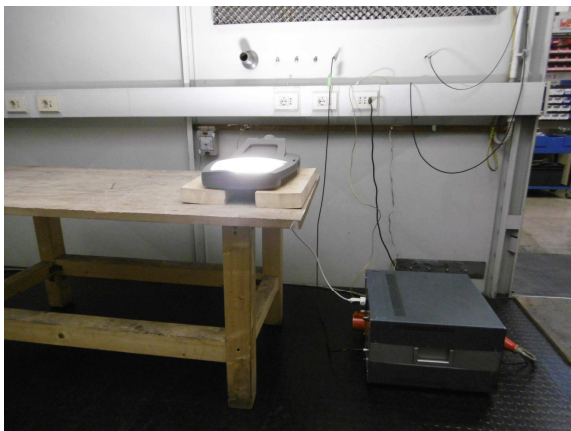
Frequency (MHz)	Level (dBμA/m)	Limit (dBμA/m)	Margin (dB)	Detector
2.9380	2.7	22.3	-19.6	QP
3.5660	1.2	22.0	-20.8	QP
4.9060	-2.1	22.0	-24.0	QP
7.3340	-4.6	22.0	-26.5	QP

5.2.6 Test equipment used

Equipment	Manufacturer	Model	Serial No.
Triple loop antenna	R&S	HM020	836 950/006
EMI receiver 20 Hz ÷ 8 GHz	R&S	ESU8	100202
Semi-anechoic chamber	Nemko	10m semi-anechoic chamber	530
Shielded room	Siemens	10m control room	1947

5.3 Terminal disturbance voltages in the frequency range 9 kHz to 30 MHz

5.3.1 Photo documentation of the test set-up



5.3.2 Test method

Measurements were made on a ground plane that extends 1-meter minimum beyond all sides of the system under test. All power was connected to the system through Line Impedance Stabilization Networks (LISN). Conducted voltage measurements on mains lines were made at the output of the LISN. Conducted voltage on load terminals were made by using a 1500 Ω probe. Measurement at control terminals shall be carried out by means of an impedance stabilization network as described in EN 55022. The ISN shall be bounded to ground.

5.3.3 Limits for mains terminals

Frequency (MHz)	Limit (dB μ V)	
	Quasi-Peak	Average
0.009 TO 0.05	110	-
0.05 TO 0.15	90 to 80*	-
0.15 TO 0.50	66 to 56*	56 to 46*
0.50 TO 5	56	46
5 TO 30	60	50

*The limits decrease linearly with the logarithm of the frequency

5.3.4 Limits for load terminals

Frequency (MHz)	Limit (dB μ V)	
	Quasi-Peak	Average
0.15 TO 0.50	80	70
0.50 TO 30	74	64

5.3.5 Limits for control terminals

Frequency (MHz)	Limit (dB μ V)	
	Quasi-Peak	Average
0.15 TO 0.50	84 to 74*	74 to 64*
0.50 TO 30	74	64

*The limits decrease linearly with the logarithm of the frequency

5.3.6 Test result

Verdict for mains terminals:	<input checked="" type="checkbox"/> P <input type="checkbox"/> F <input type="checkbox"/> N
Verdict for load terminals:	<input type="checkbox"/> P <input type="checkbox"/> F <input checked="" type="checkbox"/> N
Verdict for control terminals:	<input type="checkbox"/> P <input type="checkbox"/> F <input checked="" type="checkbox"/> N
Frequency range:	0.009 MHz – 30 MHz
Kind of test site:	Shielded room
Remarks:	

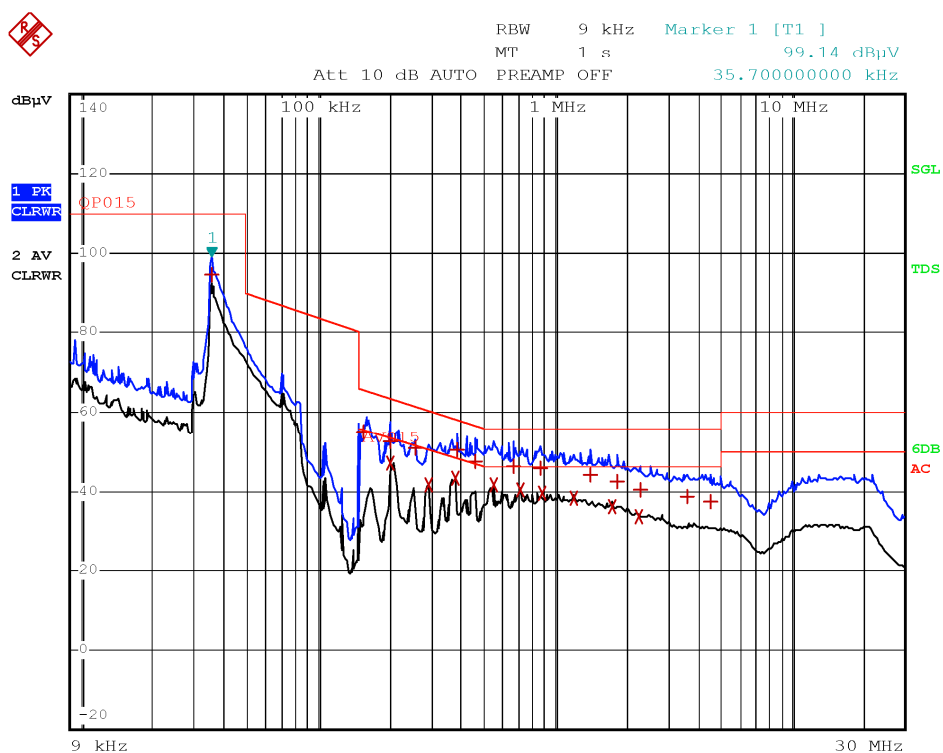
5.3.7 Test equipment used

Equipment	Manufacturer	Model	Serial N°
LISN 9 kHz ÷ 30 MHz	R&S	ESH2-Z5	872 460/041
EMI receiver 20 Hz ÷ 8 GHz	R&S	ESU8	100202
Shielded room	Siemens	Conducted emission test room	1862

5.3.8 Test protocol

Test point: Phase line
 Operation mode: 1
 Configuration mode: 1
 Remarks: -

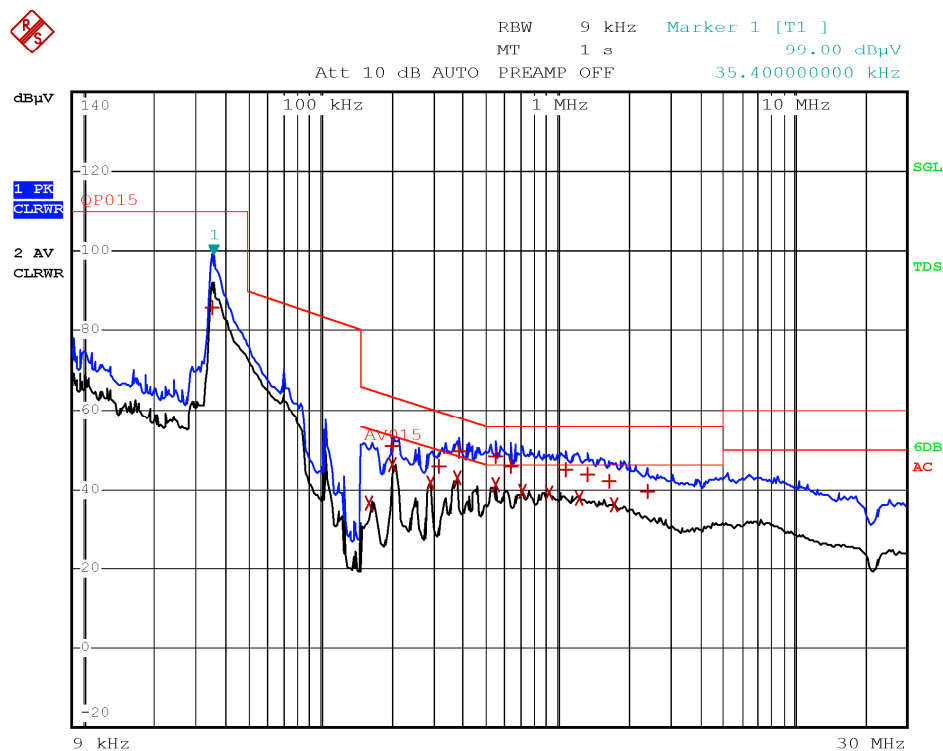
Verdict: Pass



Frequency (MHz)	Level (dBμV)	Limit (dBμV)	Margin (dB)	Detector
0.0357	94.6	110.0	-15.4	QP
0.1600	55.0	65.5	-10.5	QP
0.2000	52.3	63.6	-11.3	QP
0.2050	47.1	53.4	-6.3	Av
0.2550	50.8	61.6	-10.8	QP
0.2900	41.6	50.5	-8.9	Av
0.3750	43.2	48.4	-5.2	Av
0.3800	50.3	58.3	-7.9	QP
0.4600	47.5	56.7	-9.2	QP
0.5450	41.4	46.0	-4.6	Av
0.6700	46.4	56.0	-9.6	QP
0.7150	40.3	46.0	-5.7	Av
0.8750	45.7	56.0	-10.3	QP
0.8800	39.4	46.0	-6.6	Av
1.2100	38.0	46.0	-8.0	Av
1.4250	44.0	56.0	-12.0	QP
1.7500	36.0	46.0	-10.0	Av
1.8400	42.5	56.0	-13.5	QP
2.2450	33.8	46.0	-12.2	Av
2.3150	40.3	56.0	-15.7	QP
3.6250	38.7	56.0	-17.3	QP
4.5800	37.3	56.0	-18.7	QP

Test point: Neutral line
 Operation mode: 1
 Configuration mode: 1
 Remarks: -

Verdict: Pass



Frequency (MHz)	Level (dBμV)	Limit (dBμV)	Margin (dB)	Detector
0.0352	85.7	110.0	-24.3	QP
0.1650	36.6	55.2	-18.6	Av
0.2000	50.7	63.6	-12.9	QP
0.2050	46.3	53.4	-7.1	Av
0.2900	41.7	50.5	-8.8	Av
0.3150	45.6	59.8	-14.2	QP
0.3750	42.8	48.4	-5.6	Av
0.3800	49.7	58.3	-8.6	QP
0.5450	48.4	56.0	-7.6	QP
0.5450	41.0	46.0	-5.0	Av
0.6350	45.7	56.0	-10.3	QP
0.7100	39.4	46.0	-6.6	Av
0.9250	39.1	46.0	-6.9	Av
1.0900	45.1	56.0	-10.9	QP
1.2500	37.9	46.0	-8.1	Av
1.3400	43.7	56.0	-12.3	QP
1.6650	41.8	56.0	-14.2	QP
1.7500	36.0	46.0	-10.0	Av
2.4150	39.5	56.0	-16.5	QP

5.4 Harmonics of current

5.4.1 Photo documentation of the test set-up



5.4.2 Test method according to EN 61000-3-2

This test consists on the measurement of harmonics components of the input current which may be produced by equipment having an input current up to and including 16 A per phase, and intended to be connected to public low-voltage distribution systems. The equipment is tested under specified conditions of operation.

5.4.3 Limits for Class C equipment with an active input power > 25 W

For lighting equipment having an active input power greater than 25 W, the harmonic currents shall not exceed the relative limits given in the following table:

Harmonic order (n)	Maximum permissible harmonic current expressed as a percentage of the input current at the fundamental frequency %
2	2
3	$30 \lambda^*$
5	10
7	7
9	5
$11 \leq n \leq 39$	3
* λ is the circuit power factor	

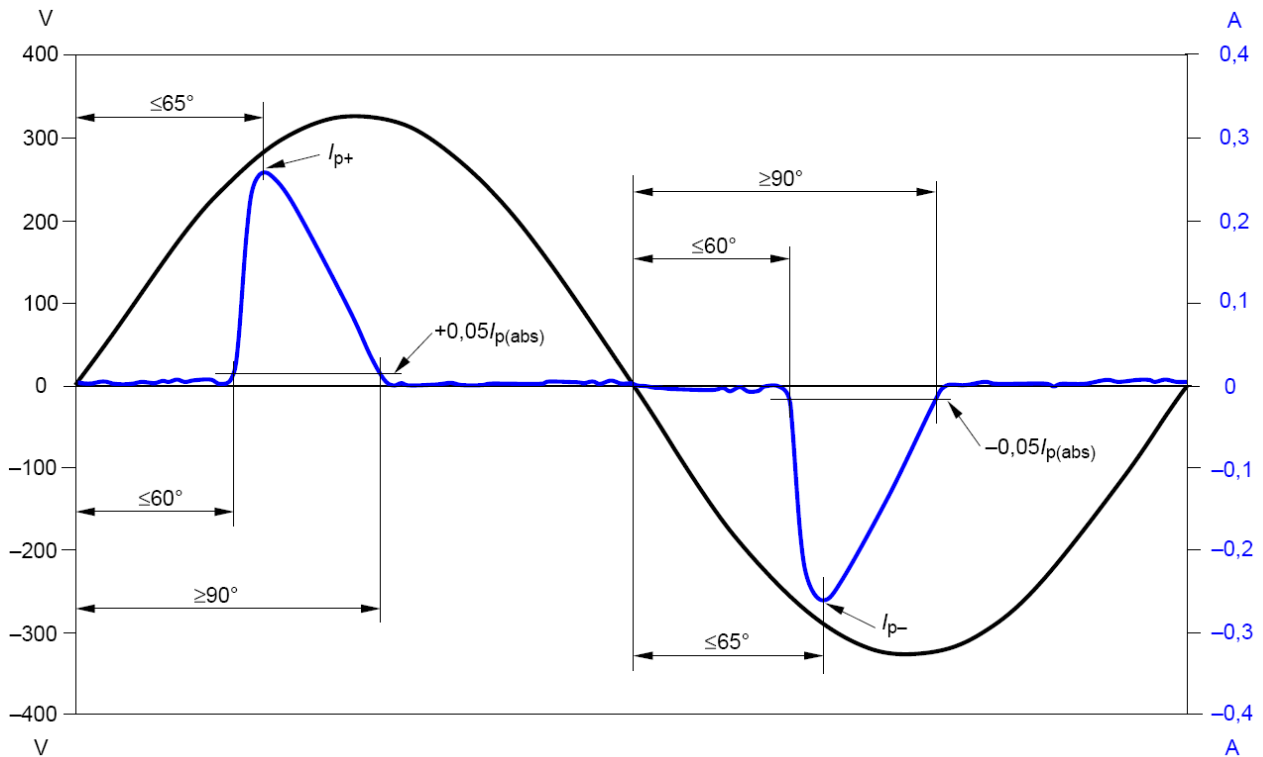
5.4.4 Limits for Class C equipment with an active input power < 25 W

Discharge lighting equipment having an active input power smaller than or equal to 25 W shall comply with one of the following two sets of requirements.

1) The harmonic currents shall not exceed the power-related limits of the following table:

Harmonic order (n)	Maximum permissible harmonic current per watt mA/W
3	3.4
5	1.9
7	1.0
9	0.5
11	0.35
$13 \leq n \leq 39$	$3.85/n$

2) The third harmonic current, expressed as a percentage of the fundamental current, shall not exceed 86 % and the fifth harmonic current shall not exceed 61 %. Also, the waveform of the input current shall be such that it reaches the 5 % current threshold before or at 60° , has its peak value before or at 65° and does not fall below the 5 % current threshold before 90° , referenced to any zero crossing of the fundamental supply voltage. The current threshold is 5 % of the highest absolute peak value that occurs in the measurement window, and the phase angle measurements are made on the cycle that includes this absolute peak value.



5.4.5 Test result

Verdict:	<input checked="" type="checkbox"/> P <input type="checkbox"/> F <input type="checkbox"/> N
Frequency range:	0 kHz – 2 kHz
Kind of test site:	Laboratory
Class:	C
Remarks:	

5.4.6 Test protocol

Operation mode: 1
 Configuration mode: 1
 Remarks: -

Verdict: Pass

Measured values			
<i>Fundamental Current</i>			
Line 1:	0.624 A		
<i>Active input Power</i>			
Line 1:	142.608 W *		
<i>Circuit power factor</i>			
Line 1:	0.985 *		

* Absolute value.

Average and Maximum harmonic current results									
Hn	Average (100% / 150% *)				Maximum (150%)				Harmonic Result
	I _{eff} [%]	of Limit [%]	Limit [%]	Result	I _{eff} [%]	of Limit [%]	Limit [%]	Result	
1	100.000				100.000				
2	0.104	5.187	2.000	n/a	0.128	4.263	3.000	n/a	n/a
3	6.959	23.554	29.546	PASS	7.039	15.883	44.320	PASS	PASS
4	0.125				0.148				
5	4.638	46.378	10.000	PASS	4.675	31.163	15.000	PASS	PASS
6	0.108				0.130				
7	3.443	49.183	7.000	PASS	3.457	32.925	10.500	PASS	PASS
8	0.107				0.134				
9	2.310	46.201	5.000	PASS	2.329	31.054	7.500	PASS	PASS
10	0.102				0.125				
11	1.442	48.070	3.000	PASS	1.460	32.453	4.500	PASS	PASS
12	0.101				0.130				
13	0.867	28.913	3.000	PASS	0.884	19.640	4.500	PASS	PASS
14	0.108				0.137				
15	0.453	15.090	3.000	n/a	0.479	10.636	4.500	n/a	n/a
16	0.105				0.126				
17	0.159	5.303	3.000	n/a	0.175	3.893	4.500	n/a	n/a
18	0.108				0.135				
19	0.116	3.882	3.000	n/a	0.144	3.193	4.500	n/a	n/a
20	0.104				0.135				
21	0.133	2.963	4.500	n/a	0.161	3.577	4.500	n/a	n/a
22	0.122				0.149				
23	0.286	6.350	4.500	n/a	0.308	6.847	4.500	n/a	n/a
24	0.105				0.134				
25	0.357	7.927	4.500	n/a	0.370	8.223	4.500	n/a	n/a
26	0.136				0.162				
27	0.223	4.962	4.500	n/a	0.243	5.405	4.500	n/a	n/a
28	0.303				0.320				
29	0.274	6.085	4.500	n/a	0.292	6.481	4.500	n/a	n/a
30	0.108				0.138				
31	0.221	4.913	4.500	n/a	0.243	5.409	4.500	n/a	n/a
32	0.112				0.140				
33	0.142	3.156	4.500	n/a	0.180	4.008	4.500	n/a	n/a
34	0.129				0.166				
35	0.138	3.067	4.500	n/a	0.160	3.557	4.500	n/a	n/a
36	0.116				0.143				
37	0.141	3.127	4.500	n/a	0.164	3.646	4.500	n/a	n/a
38	0.110				0.132				
39	0.139	3.078	4.500	n/a	0.167	3.716	4.500	n/a	n/a
40	0.109				0.137				

Note: Harmonic currents less than 0.6 % of the input current measured under the test conditions, or less than 5 mA, whichever is greater, are disregarded.

* Application of limits for average is 100% except for odd harmonics from 21 to 39, where 150% applies.

5.4.7 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Mains analyzer	EMTEST	DPA 500N	P1735202736
Power source	Elettrotest	TPS/M/6000	358 04/18

5.5 Voltage changes, voltage fluctuations and flicker

5.5.1 Photo documentation of the test set-up



5.5.2 Test method according to EN 61000-3-3

This test consists on the measurement of voltage changes, voltage fluctuations and flicker which may be produced by equipment having an input current ≤ 16 A per phase, and intended to be connected to public low-voltage distribution systems. The equipment is tested under specified conditions of operation.

5.5.3 Limits for low voltage AC mains port

The value of P_{st} shall be not greater than 1.0.

The value of Plt shall be not greater than 0.65.

The value of $d(t)$ during a voltage change shall not exceed 3.3 % for more than 500 ms.

The 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 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.

5.5.4 Test result

Verdict:	<input checked="" type="checkbox"/> P <input type="checkbox"/> F <input type="checkbox"/> N
Frequency:	50 Hz
Kind of test site:	Laboratory
Remarks:	

5.5.5 Test protocol

Operation mode: 1
 Configuration mode: 1
 Remarks: -

Verdict: Pass

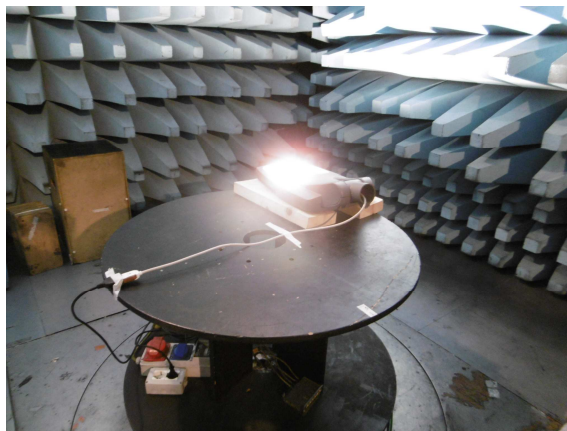
Flicker Measurements					
	P _{It}	Max P _{st}	Max D _c	Max D _{max}	Max T _{max}
Line 1:	0.012	0.028	0	< 0.2	0
Limits:	0.65	1	3.3	4	0.5
Results:	PASS	PASS	PASS	PASS	PASS

5.5.6 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Mains analyzer	EMTEST	DPA 500N	P1735202736
Power source	Elettrotest	TPS/M/6000	358 04/18

5.6 Immunity to radio-frequency electromagnetic fields

5.6.1 Photo documentation of the test set-up



5.6.2 Test method according to EN 61000-4-3

The test allows estimating of the radiated immunity of electrical and electronic equipment to electromagnetic disturbances coming from intended radio-frequency (RF) transmitters in the frequency range 80 MHz to 1000 MHz. The interference is applied on the enclosure of the equipment by using transmitting antennas. Measurements are made in a fully anechoic chamber and the indicated field strength is pre-calibrated prior to placement of the system under test.

5.6.3 Test specification

Frequency range:	80 to 1000 MHz			
Field strength:	3 V/m			
EuT - antenna separation:	2.2 m			
Modulation:	AM with 80 % in depth and 1 kHz sine wave			
Frequency step:	1 % with 3 s dwell time			
Antenna polarisation:	horizontal		vertical	
Antenna position:	front	rear	left	right

5.6.4 Test result

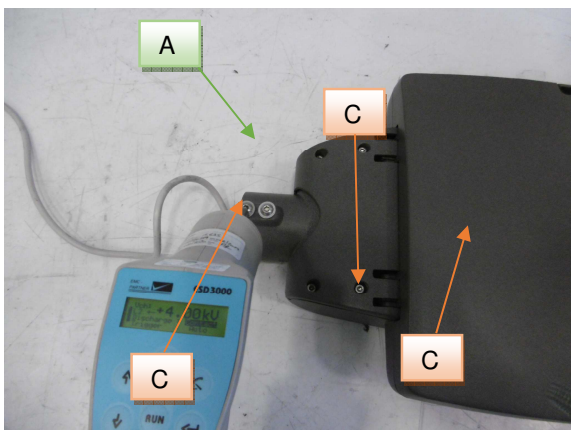
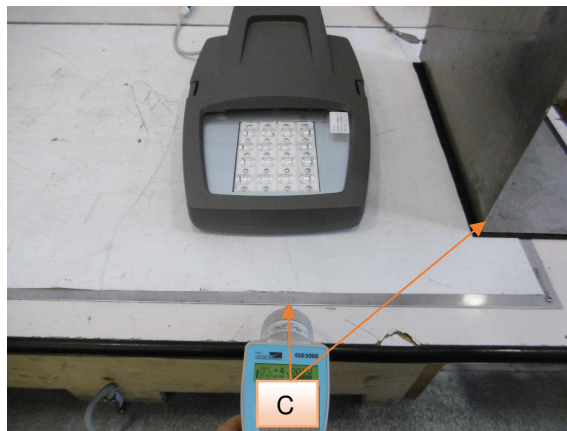
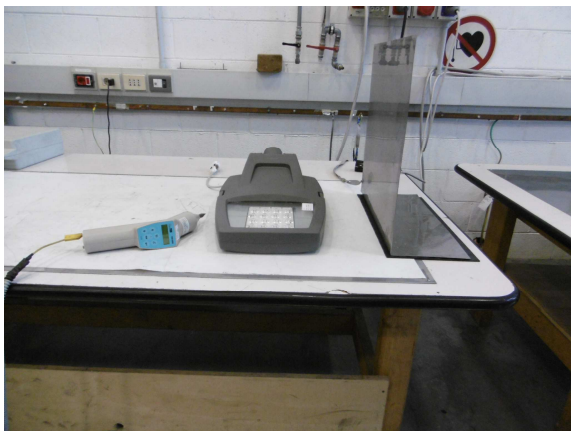
Verdict:	<input checked="" type="checkbox"/> P <input type="checkbox"/> F <input type="checkbox"/> N
Performance Criterion:	A
Operation mode:	1
Configuration mode:	1
Kind of test site:	Anechoic chamber
Remarks:	

5.6.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Biconilog antenna (20 ÷ 6000 MHz)	ETS Lindgren	3142E	00213197
RF generator (10 ÷ 20000 MHz)	R&S	SMP22	839 762/107
Broadband amplifier (80 ÷ 1000 MHz)	R&S	BBA100	101163
Power sensor	R&S	NRP18AN	100987
Semi-anechoic chamber	Nemko	3m semi-anechoic chamber	70
Shielded room	Siemens	3m control room	3

5.7 Immunity to electrostatic discharges

5.7.1 Photo documentation of the test set-up



C = Contact discharge / A = Air discharge

5.7.2 Test method according to EN 61000-4-2

The test is intended to demonstrate the immunity of equipment subjected to static electricity discharges from operators directly and to adjacent objects. The table-top equipment under test is placed on a wooden table, 0.8 m high, standing on the ground reference plane. A horizontal coupling plane (HCP) is placed on the table. The EUT and the cables are isolated from the coupling plane by an insulating support 0.5 mm thick. The floor standing equipment is isolated from the ground reference plane by an insulating support about 0.1 m thick. The vertical coupling plane (VCP) of dimensions 0.5 m x 0.5 m is placed parallel to, and positioned at a distance of 0.1 m from, the EUT. Air discharges are applied to non-metallic parts of the system. Contact discharges are applied to all accessible metallic parts. Discharges are also applied to the Horizontal and Vertical Coupling Planes.

5.7.3 Test specification

Contact discharge voltage:	4kV	
Air discharge voltage:	8kV	
Discharge impedance:	330 Ω / 150 pF	
Time between successive discharges:	≥ 1 s	
Number of discharges:	≥ 10	
Type of direct discharge:	air discharge	contact discharge
Type of indirect discharge:	contact discharge	
Polarity:	positive	negative

5.7.4 Test result

Discharge location	Type of discharge
Horizontal coupling plane (HCP)	Contact
Vertical coupling plane (VCP)	Contact
Accessible conductive parts of enclosure	Contact
Accessible Screws	Contact
Accessible non-conductive parts of enclosure	Air
Transparent led protection	Air

Verdict:	<input checked="" type="checkbox"/> P <input type="checkbox"/> F <input type="checkbox"/> N
Performance Criterion:	B
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks:	

5.7.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
ESD Test system	EMC Partner	ESD3000	252

5.8 Immunity to injected currents (radio-frequency common mode)

5.8.1 Photo documentation of the test set-up



5.8.2 Test method according to EN 61000-4-6

The test allows estimating of the conducted immunity of electrical and electronic equipment to electromagnetic disturbances coming from intended radio-frequency (RF) transmitters in the frequency range 150 kHz to 80 MHz. The interference is applied on mains supply, signal line and earth connection ports by using coupling decoupling networks or a clamp. Measurements are made on a ground plane. The EUT was located 10cm above the reference ground plane and any associated I/O cables attached to the EUT are located between 30mm and 50mm above the ground plane. The indicated field is pre-calibrated prior to placement of the system under test.

5.8.3 Test specification

Frequency range:	0.15 MHz to 80 MHz
Test voltage:	3 V
Modulation:	AM with 80 % in depth and 1 KHz sine wave
Frequency step:	1 % with 3 s dwell time

5.8.4 Test result

Coupling point	Coupling and decoupling devices	Verdict
AC Mains	M3	P

Verdict:	<input checked="" type="checkbox"/> P <input type="checkbox"/> F <input type="checkbox"/> N
Performance Criterion:	A
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks:	

5.8.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Coupling/decoupling network	EM Test	CDN M2 / M3	0307-16
RF Conducted immunity test equipment	EM Test	CWS500 CSI	V0710102305
Attenuator 6dB	EM Test	ATT6/75	0206-18
Shielded room	Siemens	Conducted immunity test room	68

5.9 Immunity to fast transients

5.9.1 Photo documentation of the test set-up



5.9.2 Test method according to EN 61000-4-4

The test is intended to demonstrate the immunity of equipment subjected to types of transient disturbances such as those originating from switching transients (interruption of inductive loads, relay contact bounce....). The bursts are applied on the mains supply port by using a coupling decoupling network and on signal and control lines ports by using a capacitive clamp. Measurements are made on a ground plane.

5.9.3 Test specification

AC power port	1 kV	
DC power port	0.5 kV	
Signal and control lines	0.5 kV	
Rise time/hold time	5/50 ns	
Burst frequency:	5.0 kHz	
Coupling duration:	≥ 120 s	
Polarity:	positive	negative

5.9.4 Test result

Coupling point	Level	Coupling devices	Verdict
AC Mains	1 kV	Network	P

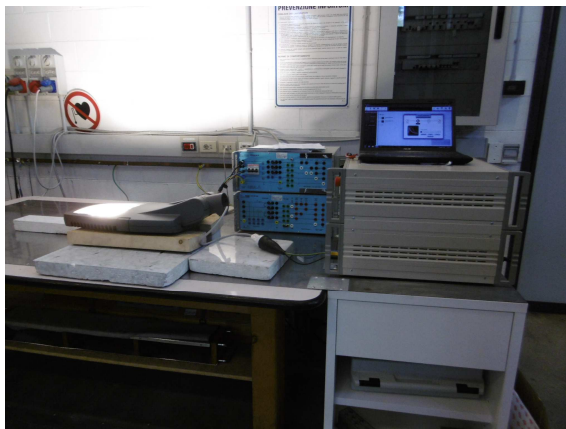
Verdict:	<input checked="" type="checkbox"/> P <input type="checkbox"/> F <input type="checkbox"/> N
Performance Criterion:	B
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks:	

5.9.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Multifunction generator	EMC partner	IMU 3000	F5-S-D-V-1505

5.10 Immunity to surges

5.10.1 Photo documentation of the test set-up



5.10.2 Test method according to EN 61000-4-5

The test allows estimating of the conducted immunity of electrical and electronic equipment to unidirectional surges caused by over voltages from switching and lighting transients. The interference is applied on symmetrical and unsymmetrical modes on mains supply port by using coupling decoupling network. Pulses shall be applied to the a.c. voltage wave as follows; five positive polarity pulses at the 90° phase angle, five negative polarity pulses at the 270° phase angle. Two test levels are given for different types of lighting equipment. Each surge was applied 60 seconds after the previous surge.

5.10.3 Test specification for AC power ports

Characteristics	Test levels		
	Device		
	Self-ballasted lamps and semi-luminaires	Luminaires and independent auxiliaries	
		Input power	
		≤25W	>25W
Wave-shape data	1.2/50 μs	1.2/50 μs	1.2/50 μs
Test level for line to line surge	±0.5 kV	±0.5 kV	±1.0 kV
Test level for line to ground surge	±1.0 kV	±1.0 kV	±2.0 kV

Number of surges:	5 Surges/Phase angle	
Source impedance	2 Ω + 18 μ F (line to line) and 12 Ω + 9 μ F (line to ground)	
Phase angle:	90°	270°
Repetition rate:	60 s	
Rise time:	1.2 μ s	
Time to half value:	50 μ s	
Polarity:	positive	negative

5.10.4 Test result

Coupling point	Level	Coupling network	Verdict
AC power port – line to line	0.5, 1 kV	2 Ω + 18 μ F	P
AC power port – line to ground	0.5, 1 kV and 2 kV	12 Ω + 9 μ F	P

Verdict:	<input checked="" type="checkbox"/> P <input type="checkbox"/> F <input type="checkbox"/> N
Performance Criterion:	C (B for Luminaire for emergency lighting)
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks:	

5.10.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Multifunction generator	EMC partner	IMU 3000	F5-S-D-V-1505

5.11 Immunity to Power frequency magnetic fields

5.11.1 Photo documentation of the test set-up



5.11.2 Test method according to EN 61000-4-8

This test is intended to demonstrate the immunity of equipment when subjected to power frequency magnetic fields. The test magnetic field is obtained by a current flowing in an induction coil; the application of the test field to the EUT is by the immersion method.

5.11.3 Test specification

Test frequency:	50 Hz		
Continuous field intensity:	3 A/m		
Duration (Continuous field):	60 s each Axis		
Axis:	x-axis	y-axis	z-axis

5.11.4 Test result

Verdict:	<input checked="" type="checkbox"/> P <input type="checkbox"/> F <input type="checkbox"/> N
Performance Criterion:	A
Operation mode:	1
Configuration mode:	1
Kind of test site:	Helmholtz coils
Remarks:	

5.11.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Field strength meter Vac	Holaday	HI-3604	86265
Transformer 240/24 V 2.5 KVA	Eletras	220/24	2.459
Variac	RS	WCV 8E-1	3/122017
Helmholtz induction coil antenna	G.I.E.	IEC 1000-4-8	111962

5.12 Immunity to voltage dips and short interruptions

5.12.1 Photo documentation of the test set-up



5.12.2 Test method according to EN 61000-4-11

The test allows estimating of the conducted immunity of electrical and electronic equipment connected to low-voltage power supply networks for voltage dips and short interruptions. Testing is performed with the product connected directly to a generator capable of simulating the voltage drops and interrupts as described.

5.12.3 Test specification

Nominal Mains Voltage	230 Vac	
Rated frequency	50 Hz	
Number of voltage dips and interruptions	3	
Sync Angle	0°	
Test voltage level	70 %	0 %
Number of periods	10	0.5

5.12.4 Test result

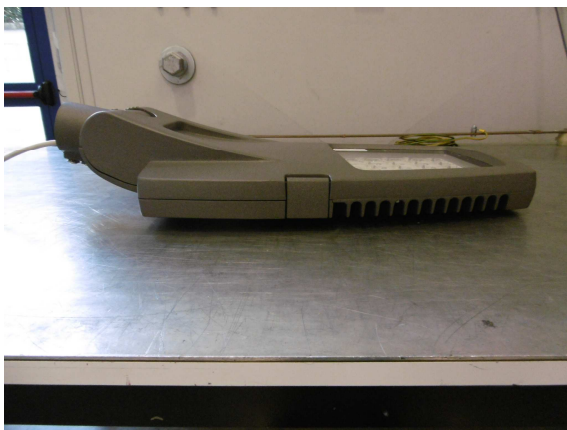
	Level of reduction	Residual voltage	Duration	Performance criterion	Verdict
1	100%	0%	0.5 period	C	P
2	30%	70%	10 periods	B	P

Verdict:	<input checked="" type="checkbox"/> P <input type="checkbox"/> F <input type="checkbox"/> N
Performance Criterion:	B and C
Operation mode:	1
Configuration mode:	1
Kind of test site:	Laboratory
Remarks:	

5.12.5 Test equipment used

Equipment	Manufacturer	Model	Serial N°
Multifunction generator	EMC partner	IMU 3000	F5-S-D-V-1505

6 EUT PHOTOS





End of report