Test Report issued under the responsibility of:

TÜVRheinland®

TEST REPORT
IEC 62471
Photobiological safety of lamps and lamp systems

Report Reference No. ..... :	50039435 002
Date of issue ..... :	2016-10-31
Total number of pages ..... :	38
Testing Laboratory ..... :	TÜV Rheinland Japan Ltd., Yokohama Laboratory
Address ..... :	Global Technology Assessment Center (GTAC), 4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan
Applicant's name ..... :	CITIZEN ELECTRONICS CO., LTD.
Address ..... :	1-23-1 Kamikurechi, Fujiyoshida-shi, Yamanashi 403-0001, Japan
Test specification:	
Standard ..... :	IEC 62471:2006 (First Edition)
Test procedure ..... :	CB scheme
Non-standard test method…….. :	N/A
Test Report Form No. ..... :	IEC62471A
TRF Originator ..... :	VDE Testing and Certification Institute
Master TRF ..... :	Dated 2009-05

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

Test item description	:	LED module
Trade Mark	:	(none)
Manufacturer	:	(same as Applicant)
Model/Type reference	:	**1)** CLUttt-uuvvC4-wwxyzab**cdef** ttt = 028, 038, 048, 058; uu = 07, 09, 12, 13, **15, 17**, 18, 36; vv = 01, 02, 03, 04, 05, 06, 08, 10, 12, 18, 25; ww = **20** – 65; x = 1 - 9 , A – Z; y = M, L, H; z = 1 – 9; a = A – Z; b = 1 – 9 **c= "-",0 - 9 , A – Z or blank; d = 0 - 9 , A – Z or blank,** **e = 0 - 9 , A – Z or blank, f = 0 - 9 , A – Z or blank** **2) CLUttt-uuvvC1-wwxyzabcdef** **ttt = 038; uu = 12; vv = 05; ww = 20 – 65; x = 1 - 9 , A – Z;** **y = M, L, H; z = 1 – 9; a = A – Z; b = 1 – 9** **c= "-",0 – 9, A – Z or blank; d = 0 – 9, A – Z or blank,** **e = 0 – 9 , A – Z or blank, f = 0 – 9 , A – Z or blank** (refer to pages 8 - 9 for available models)
Ratings	:	I_F = 230mA/die (refer to pages 8 - 9 for ratings)

Testing procedure and testing location:	
☒ **Testing Laboratory:**	TÜV Rheinland Japan Ltd., Yokohama Laboratory
Testing location/ address ..... :	Global Technology Assessment Center (GTAC), 4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan
☐ **Associated CB Laboratory:**	
Testing location/ address ..... :	
Tested by (name + signature)..... :	T. Muraya
Approved by (+ signature)..... :	K. Horiuchi
☐ Testing procedure: TMP	
Tested by (name + signature)..... :	
Approved by (+ signature)..... :	
Testing location/ address ..... :	
☐ Testing procedure: WMT	
Tested by (name + signature)..... :	
Witnessed by (+ signature)..... :	
Approved by (+ signature)..... :	
Testing location/ address ..... :	
☐ Testing procedure: SMT	
Tested by (name + signature)..... :	
Approved by (+ signature)..... :	
Supervised by (+ signature)..... :	
Testing location/ address ..... :	
☐ Testing procedure: RMT	
Tested by (name + signature)..... :	
Approved by (+ signature)..... :	
Supervised by (+ signature)..... :	
Testing location/ address ..... :	

List of Attachments:

- Photo Documentation (total 2 pages)
- Attachment 1 (included in this report): EU Group Differences
- Attachment 2 (included in this report): Furthermore remarks
- Attachment 3 (included in this report): IEC/TR 62778 test report

Summary of testing:

To confirm the continued compliance with the standard, additional tests conducted on model CLU048-1818C4-203M2K1 to represent the other similar models.

(see General product information)

Tests performed:	**Testing location:**
Source profile, irradiance measurement and radiance measurement were performed for Non-GLS conditions. (at the 200mm distance to the apparent source)	(see “testing procedure and testing location“ on page 3)

Summary of compliance with National Differences:

EU Group Differences based on EU Directive 2006/25/EC.

Copy of marking plate:

(none)

Test item particulars ..... :	
Tested lamp ..... :	☒ continuous wave lamps ☐ pulsed lamps
Tested lamp system ..... :	LED
Lamp classification group ..... :	☐ exempt ☐ risk 1 ☒ risk 2 ☐ risk 3
Lamp cap ..... :	N/A
Bulb ..... :	N/A
Rated of the lamp ..... :	N/A
Furthermore marking on the lamp ..... :	N/A
Seasoning of lamps according IEC standard ..... :	N/A
Used measurement instrument ..... :	Bentham IDR300-PSL
Temperature by measurement ..... :	22-23 °C (Tested in this report) 23-24 °C (TUV CB test report No.50031066 001)
Information for safety use ..... :	N/A
Possible test case verdicts:	
– test case does not apply to the test object ..... :	N/A
– test object does meet the requirement ..... :	P (Pass)
– test object does not meet the requirement ..... :	F (Fail)
Testing:	
Date of receipt of test item ..... :	2016-10-20 (Tested in this report) 2015-05-29 (TUV CB test report No.50031066 001)
Date (s) of performance of tests ..... :	2016-10-21 (Tested in this report) 2015-06-17, 2015-06-18, 2015-07-06 (TUV CB test report No.50031066 001)
General remarks:	
The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory. "(see Enclosure #)" refers to additional information appended to the report. "(see appended table)" refers to a table appended to the report. Throughout this report a ☐ comma / ☒ point is used as the decimal separator.	
Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided ..... : When differences exist; they shall be identified in the General product information section.	☒ Yes ☐ Not applicable

Name and address of factory (ies).....:	1. CITIZEN ELECTRONICS FUNEHIKI CO., LTD. 6-2, Kouyoudai, Funehiki-cho, Tamura-shi, Fukushima 963-4318, Japan 2. CITIZEN ELECTRONICS TIMEL CO., LTD. 539-21, Koasumi, Fujiyoshida-shi, Yamanashi 403-0002, Japan 3. JIANG XING ELECTRONICS LTD. Building B, 399 Jinxing Road, Jianghai District, Jiangmen, Guangdong 529000, P.R. China
Remark:	
Manufacturer: (not changed)	
Factory(ies): (not changed)	
History of amendments and modifications: Ref. No. 50039541 001, dated 2016-05-13 (original test report)	

General product information:

Description of change(s): (Modification)

1. Change of model number

From: CLUttt-uuvvC4-wwxyzab To: CLUttt-uuvvC4-wwxyzabcdef

Additional suffixes “c”, “d”, “e” and “f” denote internal differences not affect to safety.

2. Addition of models

2-1. Addition of Correlated color temperature (CCT) between 2000 K and 2700 K for all models.
Suffix “ww” which shows CCT range was changed from 27 – 65 to 20 – 65.
To confirm the compliance for the lowest CCT, additional tests were conducted.

2-2. Addition of models, CLU038-1205C1-wwxyzabcdef (ref No.2) – 1 to 3)
The additional models are identical to CLU036-1205C1-wwxyzab which was tested in TUV CB test report No. 50031066 001.
Test data with the representative models CLU046-1818C1-653Mzab and CLU056-3618C1-653Mzab as the worst case are used for that of additional models.

2-3. Addition of die array for CLUttt-uuvvC4-wwxyzabcdef
Models for ref No. 1) – 45 to 56 are added.
Since the performance of additional models are within the worst case tested in the original report, no additional tests were conducted.

3. Modification of the assessment according to IEC/TR 62778

The assessment was modified with official TRF.
For details, see Attachment 3.

Differences between the models:

- Type nomenclature:

1) CLUttt-uuvvC4-wwxyzabcdef

ttt = 028, 038, 048, 058 (Part Code)

uu = 07, 09, 12, 13, 15, 17, 18, 36 (Dies in series)

vv = 01, 02, 03, 04, 05, 06, 08, 10, 12, 18, 25 (Dies in parallel)

ww = 20 – 65 (Correlated color temperature; 2000 K – 6500 K)

x = 1 - 9 , A - Z (Internal code)

y = M, L, H (CRI)

z = 1 - 9 (CRI)

a = A - Z (Internal code)

b = 1 - 9 (Internal code)

c = “-”, 0 - 9 , A – Z or blank (Internal code)

d = 0 - 9 , A – Z or blank (Internal code)

e = 0 - 9 , A – Z or blank (Internal code)

f = 0 - 9 , A – Z or blank (Internal code)

2) CLUttt-uuvvC1-wwxyzabcdef

ttt = 038 (Part Code)

uu = 12 (Dies in series)

vv = 05 (Dies in parallel)

ww = 20 – 65 (Correlated color temperature; 2000 K – 6500 K)

x = 1 - 9 , A - Z (Internal code)

y = M, L, H (CRI)

z = 1 - 9 (CRI)

a = A - Z (Internal code)

b = 1 - 9 (Internal code)

c = “-”, 0 - 9 , A – Z or blank (Internal code)

d = 0 - 9 , A – Z or blank (Internal code)

e = 0 - 9 , A – Z or blank (Internal code)

f = 0 - 9 , A – Z or blank (Internal code)

(see below for available models)

<Model list (changes are marked in bold letter)>

1) CLUttt-uuvvC4-wwxyzabcdef

No.	Series	Product code	Ra min.	Forward current	Forward voltage	Input Power	Luminous flux *)
				(mA)	(V)	(W)	(lm)
1	CLU028	CLU028-0701C4-wwxMzab**cde**f	80	230	22.5	5.2	632
2		CLU028-0901C4-wwxMzab**cdef**	80	230	30	6.9	812
3		CLU028-1201C4-wwxLzab**cdef**	70	230	39.6	9.1	1105
4		CLU028-1201C4-wwxMzab**cdef**	80				
5		CLU028-1201C4-wwxHzab**cdef**	90				
6		CLU028-1301C4-wwxLzab**cdef**	70	230	42.9	9.9	1105
7		CLU028-1301C4-wwxMzab**cdef**	80				
8		CLU028-1301C4-wwxHzab**cdef**	90				
9		CLU028-1202C4-wwxLzab**cdef**	70	460	39.6	18.2	2219
10		CLU028-1202C4-wwxMzab**cdef**	80				
11		CLU028-1202C4-wwxHzab**cdef**	90				
12		CLU028-1203C4-wwxLzab**cdef**	70	690	39.6	27.3	3238
13		CLU028-1203C4-wwxMzab**cdef**	80				
14		CLU028-1203C4-wwxHzab**cdef**	90				
15		CLU028-1204C4-wwxLzab**cdef**	70	920	39.6	36.4	4239
16		CLU028-1204C4-wwxMzab**cdef**	80				
17		CLU028-1204C4-wwxHzab**cdef**	90				
18	CLU038	CLU038-1205C4-wwxLzab**cdef**	70	1150	39.6	45.5	5531
19		CLU038-1205C4-wwxMzab**cdef**	80				
20		CLU038-1205C4-wwxHzab**cdef**	90				
21		CLU038-1206C4-wwxLzab**cdef**	70	1380	39.6	54.6	6568
22		CLU038-1206C4-wwxMzab**cdef**	80				
23		CLU038-1206C4-wwxHzab**cdef**	90				
24		CLU038-1208C4-wwxLzab**cdef**	70	1840	39.6	72.9	8588
25		CLU038-1208C4-wwxMzab**cdef**	80				
26		CLU038-1208C4-wwxHzab**cdef**	90				
27		CLU038-1210C4-wwxLzab**cdef**	70	2300	39.6	91.1	10442
28		CLU038-1210C4-wwxMzab**cdef**	80				
29		CLU038-1210C4-wwxHzab**cdef**	90				
30	CLU048	CLU048-1212C4-wwxLzab**cdef**	70	2760	39.6	109.3	13320
31		CLU048-1212C4-wwxMzab**cdef**	80				
32		CLU048-1212C4-wwxHzab**cdef**	90				
33		CLU048-1812C4-wwxLzab**cdef**	70	2760	59.6	164.5	19494
34		CLU048-1812C4-wwxMzab**cdef**	80				
35		CLU048-1812C4-wwxHzab**cdef**	90				
36		CLU048-1818C4-wwxLzab**cdef**	70	4140	59.6	246.7	28458
37		CLU048-1818C4-wwxMzab**cdef**	80				
38		CLU048-1818C4-wwxHzab**cdef**	90				
39	CLU058	CLU058-1825C4-wwxLzab**cdef**	70	5750	59.6	342.7	41670
40		CLU058-1825C4-wwxMzab**cdef**	80				
41		CLU058-1825C4-wwxHzab**cdef**	90				
42		CLU058-3618C4-wwxLzab**cdef**	70	4140	115.9	479.8	57539
43		CLU058-3618C4-wwxMzab**cdef**	80				
44		CLU058-3618C4-wwxHzab**cdef**	90				

No.	Series	Product code	Ra min.	Forward current	Forward voltage	Input Power	Luminous flux *)
				(mA)	(V)	(W)	(lm)
45	**CLU048**	**CLU048-1318C4-wwxLzabcdef**	**70**	**4140**	**43**	**178.0**	**22529**
46		**CLU048-1318C4-wwxMzabcdef**	**80**				
47		**CLU048-1318C4-wwxHzabcdef**	**90**				
48		**CLU048-1312C4-wwxLzabcdef**	**70**	**2760**	**43**	**118.7**	**15156**
49		**CLU048-1312C4-wwxMzabcdef**	**80**				
50		**CLU048-1312C4-wwxHzabcdef**	**90**				
51		**CLU048-1512C4-wwxLzabcdef**	**70**	**2760**	**49.3**	**136.1**	**14137**
52		**CLU048-1512C4-wwxMzabcdef**	**80**				
53		**CLU048-1512C4-wwxHzabcdef**	**90**				
54	**CLU028**	**CLU028-1701C4-wwxLzabcdef**	**70**	**230**	**55.9**	**12.9**	**1523**
55		**CLU028-1701C4-wwxMzabcdef**	**80**				
56		**CLU028-1701C4-wwxHzabcdef**	**90**				

***) Rated value at highest CCT and Ra = 80min in each type**

2) CLUttt-uuvvC1-wwxyzabcdef

No.	**Series**	**Product code**	**Ra min.**	**Forward current**	**Forward voltage**	**Input Power**	**Lumi-nous flux *)**
				(mA)	**(V)**	**(W)**	**(lm)**
1	**CLU038**	**CLU038-1205C1-wwxLzabcdef**	**70**	**1150**	**39.6**	**45.5**	**5718**
2		**CLU038-1205C1-wwxMzabcdef**	**80**				
3		**CLU038-1205C1-wwxHzabcdef**	**90**				

***) Rated value at highest CCT and Ra = 80min in each type**

IEC 62471			
Clause	Requirement + Test	Result - Remark	Verdict
4	**EXPOSURE LIMITS**		P
4.1	General		P
	The exposure limits in this standard is not less than 0,01 ms and not more than any 8-hour period and should be used as guides in the control of exposure		P
	Detailed spectral data of a light source are generally required only if the luminance of the source exceeds 10^4 cd·m^{-2}	(see clause 4.3)	P
4.3	Hazard exposure limits		P
4.3.1	Actinic UV hazard exposure limit for the skin and eye	Considered.	P
	The exposure limit for effective radiant exposure is 30 J·m^{-2} within any 8-hour period		P
	To protect against injury of the eye or skin from ultraviolet radiation exposure produced by a broad-band source, the effective integrated spectral irradiance , E_S, of the light source shall not exceed the levels defined by:		P
	$E_s \cdot t = \sum_{200}^{400} \sum_{t} E_\lambda(\lambda,t) \cdot S_{UV}(\lambda) \cdot \Delta t \cdot \Delta\lambda \le 30$ J·m^{-2}		P
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye or skin shall be computed by:		P
	$t_{max} = \frac{30}{E_s}$ s		P
4.3.2	Near-UV hazard exposure limit for eye	Considered.	P
	For the spectral region 315 nm to 400 nm (UV-A) the total radiant exposure to the eye shall not exceed 10000 J·m^{-2} for exposure times less than 1000 s. For exposure times greater than 1000 s (approximately 16 minutes) the UV-A irradiance for the unprotected eye, E_{UVA}, shall not exceed 10 W·m^{-2}.		P
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye for time less than 1000 s, shall be computed by:		P
	$t_{max} \le \frac{10\,000}{E_{UVA}}$ s		P
4.3.3	Retinal blue light hazard exposure limit	Considered.	P

IEC 62471			
Clause	Requirement + Test	Result - Remark	Verdict
	To protect against retinal photochemical injury from chronic blue-light exposure, the integrated spectral radiance of the light source weighted against the blue-light hazard function, B(λ), i.e., the blue-light weighted radiance , L_B, shall not exceed the levels defined by:		P
	$L_B \cdot t = \sum_{300}^{700} \sum_{t} L_\lambda(\lambda,t) \cdot B(\lambda) \cdot \Delta t \cdot \Delta\lambda \le 10^6$ J · m^{-2} · sr^{-1}	for t ≤ 10^4 s $t_{max} = \frac{10^6}{L_B}$	P
	$L_B = \sum_{300}^{700} L_\lambda \cdot B(\lambda) \cdot \Delta\lambda \le 100$ W · m^{-2} · sr^{-1}	for t > 10^4 s	P
4.3.4	Retinal blue light hazard exposure limit - small source		N/A
	Thus the spectral irradiance at the eye E_λ, weighted against the blue-light hazard function B(λ) shall not exceed the levels defined by:	(see appended table 4.2)	N/A
	$E_B \cdot t = \sum_{300}^{700} \sum_{t} E_\lambda(\lambda,t) \cdot B(\lambda) \cdot \Delta t \cdot \Delta\lambda \le 100$ J · m^{-2}	for t ≤ 100 s	N/A
	$E_B = \sum_{300}^{700} E_\lambda \cdot B(\lambda) \cdot \Delta\lambda \le 1$ W · m^{-2}	for t > 100 s	N/A
4.3.5	Retinal thermal hazard exposure limit		P
	To protect against retinal thermal injury, the integrated spectral radiance of the light source, L_λ, weighted by the burn hazard weighting function R(λ) (from Figure 4.2 and Table 4.2), i.e., the burn hazard weighted radiance, shall not exceed the levels defined by:		P
	$L_R = \sum_{380}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \le \frac{50\,000}{\alpha \cdot t^{0,25}}$ W · m^{-2} · sr^{-1}	(10 µs ≤ t ≤ 10 s)	P
4.3.6	Retinal thermal hazard exposure limit – weak visual stimulus		N/A
	For an infrared heat lamp or any near-infrared source where a weak visual stimulus is inadequate to activate the aversion response, the near infrared (780 nm to 1400 nm) radiance, L_{IR}, as viewed by the eye for exposure times greater than 10 s shall be limited to:		N/A
	$L_{IR} = \sum_{780}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \le \frac{6\,000}{\alpha}$ W · m^{-2} · sr^{-1}	t > 10 s	N/A
4.3.7	Infrared radiation hazard exposure limits for the eye	Considered.	P

IEC 62471			
Clause	Requirement + Test	Result - Remark	Verdict
	The avoid thermal injury of the cornea and possible delayed effects upon the lens of the eye (cataracto-genesis), ocular exposure to infrared radiation, E_{IR}, over the wavelength range 780 nm to 3000 nm, for times less than 1000 s, shall not exceed:		P
	$E_{IR} = \sum_{780}^{3\,000} E_\lambda \cdot \Delta\lambda \le 18\,000 \cdot t^{-0,75}$ $W \cdot m^{-2}$	t ≤ 1000 s	P
	For times greater than 1000 s the limit becomes:		P
	$E_{IR} = \sum_{780}^{3\,000} E_\lambda \cdot \Delta\lambda \le 100$ $W \cdot m^{-2}$	t > 1000 s	P
4.3.8	Thermal hazard exposure limit for the skin	Considered.	P
	Visible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be limited to:		P
	$E_H \cdot t = \sum_{380}^{3\,000} \sum_{t} E_\lambda(\lambda,t) \cdot \Delta t \cdot \Delta\lambda \le 20\,000 \cdot t^{0,25}$ $J \cdot m^{-2}$		P

5	**MEASUREMENT OF LAMPS AND LAMP SYSTEMS**		P
5.1	Measurement conditions		P
	Measurement conditions shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.	(see above)	P
5.1.1	Lamp ageing (seasoning)	LED Source.	N/A
	Seasoning of lamps shall be done as stated in the appropriate IEC lamp standard.		N/A
5.1.2	Test environment		P
	For specific test conditions, see the appropriate IEC lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.	Standard laboratory (dark room) condition.	P
5.1.3	Extraneous radiation	Considered.	P
	Careful checks should be made to ensure that ex-traneous sources of radiation and reflections do not add significantly to the measurement results.		P
5.1.4	Lamp operation		N/A
	Operation of the test lamp shall be provided in ac-cordance with:		N/A
	– the appropriate IEC lamp standard, or		N/A
	– the manufacturer' s recommendation		N/A
5.1.5	Lamp system operation		P

IEC 62471			
Clause	Requirement + Test	Result - Remark	Verdict
	The power source for operation of the test lamp shall be provided in accordance with:		P
	– the appropriate IEC standard, or		N/A
	– the manufacturer' s recommendation		P
5.2	Measurement procedure		P
5.2.1	Irradiance measurements		P
	Minimum aperture diameter 7mm.		P
	Maximum aperture diameter 50 mm.		P
	The measurement shall be made in that position of the beam giving the maximum reading.	Considered.	P
	The measurement instrument is adequate calibrated.	Measurement system calibrated with standard lamps.	P
5.2.2	Radiance measurements		P
5.2.2.1	Standard method		P
	The measurements made with an optical system.		P
	The instrument shall be calibrated to read in absolute radiant power per unit receiving area and per unit solid angle to acceptance averaged over the field of view of the instrument.		P
5.2.2.2	Alternative method		P
	Alternatively to an imaging radiance set-up, an irradiance measurement set-up with a circular field stop placed at the source can be used to perform radiance measurements.	For 100mrad L_B measurement.	P
5.2.3	Measurement of source size		P
	The determination of α, the angle subtended by a source, requires the determination of the 50% emission points of the source.	CLU048-1818C4-203Mzabcdef 21.48 mm x 21.20 mm α = 100.0 mrad (Tested in this test report) CLU046-1818C1-653Mzab 18.99 mm x 18.62 mm α = 94.0 mrad CLU056-3618C1-653Mzab 20.67 mm x 20.48 mm α = 100.0 mrad (from TUV CB test report No. 50031066 001)	P
5.2.4	Pulse width measurement for pulsed sources	Continuous Wave lamps.	N/A
	The determination of Δt, the nominal pulse duration of a source, requires the determination of the time during which the emission is > 50% of its peak value.		N/A

IEC 62471			
Clause	Requirement + Test	Result - Remark	Verdict
5.3	Analysis methods		P
5.3.1	Weighting curve interpolations		P
	To standardize interpolated values, use linear interpolation on the log of given values to obtain intermediate points at the wavelength intervals desired.	(see appended table 4.1)	P
5.3.2	Calculations		P
	The calculation of source hazard values shall be performed by weighting the spectral scan by the appropriate function and calculating the total weighted energy.		P
5.3.3	Measurement uncertainty		P
	The quality of all measurement results must be quantified by an analysis of the uncertainty.		P
6	**LAMP CLASSIFICATION**		P
	For the purposes of this standard it was decided that the values shall be reported as follows:	(see appended table 6.1)	P
	– for lamps intended for general lighting service, the hazard values shall be reported as either irradiance or radiance values at a distance which produces an illuminance of 500 lux, but not at a distance less than 200 mm	Non-GLS	N/A
	– for all other light sources, including pulsed lamp sources, the hazard values shall be reported at a distance of 200 mm		P
6.1	Continuous wave lamps		P
6.1.1	Exempt Group		N/A
	In the exempt group are lamps, which do not pose any photobiological hazard. The requirement is met by any lamp that does not pose:		N/A
	– an actinic ultraviolet hazard (E_S) within 8-hours exposure (30000 s), nor		N/A
	– a near-UV hazard (E_{UVA}) within 1000 s, (about 16 min), nor		N/A
	– a retinal blue-light hazard (L_B) within 10000 s (about 2,8 h), nor		N/A
	– a retinal thermal hazard (L_R) within 10 s, nor		N/A
	– an infrared radiation hazard for the eye (E_{IR}) within 1000 s		N/A
6.1.2	Risk Group 1 (Low-Risk)		N/A

IEC 62471			
Clause	Requirement + Test	Result - Remark	Verdict
	In this group are lamps, which exceeds the limits for the exempt group but that does not pose:		N/A
	– an actinic ultraviolet hazard (E_S) within 10000 s, nor		N/A
	– a near ultraviolet hazard (E_{UVA}) within 300 s, nor		N/A
	– a retinal blue-light hazard (L_B) within 100 s, nor		N/A
	– a retinal thermal hazard (L_R) within 10 s, nor		N/A
	– an infrared radiation hazard for the eye (E_{IR}) within 100 s		N/A
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal hazard (L_{IR}), within 100 s are in Risk Group 1.		N/A
6.1.3	Risk Group 2 (Moderate-Risk)		P
	This requirement is met by any lamp that exceeds the limits for Risk Group 1, but that does not pose:		P
	– an actinic ultraviolet hazard (E_S) within 1000 s exposure, nor		P
	– a near ultraviolet hazard (E_{UVA}) within 100 s, nor		P
	– a retinal blue-light hazard (L_B) within 0,25 s (aversion response), nor		P
	– a retinal thermal hazard (L_R) within 0,25 s (aversion response), nor		P
	– an infrared radiation hazard for the eye (E_{IR}) within 10 s		P
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal hazard (L_{IR}), within 10 s are in Risk Group 2.		P
6.1.4	Risk Group 3 (High-Risk)		N/A
	Lamps which exceed the limits for Risk Group 2 are in Group 3.		N/A
6.2	Pulsed lamps	Continuous Wave lamps.	N/A
	Pulse lamp criteria shall apply to a single pulse and to any group of pulses within 0,25 s.		N/A
	A pulsed lamp shall be evaluated at the highest nominal energy loading as specified by the manufacturer.		N/A
	The risk group determination of the lamp being tested shall be made as follows:		N/A
	– a lamp that exceeds the exposure limit shall be classified as belonging to Risk Group 3 (High-Risk)		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	– for single pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance does is below the EL shall be classified as belonging to the Exempt Group		N/A
	– for repetitively pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance dose is below the EL, shall be evaluated using the continuous wave risk criteria discussed in clause 6.1, using time averaged values of the pulsed emission		N/A

IEC 62471			
Clause	Requirement + Test	Result - Remark	Verdict

Table 4.1	Spectral weighting function for assessing ultraviolet hazards for skin and eye		P

Wavelength[1] λ, nm	**UV hazard function $S_{uv}(\lambda)$**	**Wavelength λ, nm**	**UV hazard function $S_{uv}(\lambda)$**
200	0.030	313*	0.006
205	0.051	315	0.003
210	0.075	316	0.0024
215	0.095	317	0.0020
220	0.120	318	0.0016
225	0.150	319	0.0012
230	0.190	320	0.0010
235	0.240	322	0.00067
240	0.300	323	0.00054
245	0.360	325	0.00050
250	0.430	328	0.00044
254*	0.500	330	0.00041
255	0.520	333*	0.00037
260	0.650	335	0.00034
265	0.810	340	0.00028
270	1.000	345	0.00024
275	0.960	350	0.00020
280*	0.880	355	0.00016
285	0.770	360	0.00013
290	0.640	365*	0.00011
295	0.540	370	0.000093
297*	0.460	375	0.000077
300	0.300	380	0.000064
303*	0.120	385	0.000053
305	0.060	390	0.000044
308	0.026	395	0.000036
310	0.015	400	0.000030

[1] Wavelengths chosen are representative: other values should be obtained by logarithmic interpolation at intermediate wavelengths.
* Emission lines of a mercury discharge spectrum.

IEC 62471			
Clause	Requirement + Test	Result - Remark	Verdict

Table 4.2	Spectral weighting functions for assessing retinal hazards from broadband optical sources	P

Wavelength nm	**Blue-light hazard function B (λ)**	**Burn hazard function R (λ)**
300	0.01	
305	0.01	
310	0.01	
315	0.01	
320	0.01	
325	0.01	
330	0.01	
335	0.01	
340	0.01	
345	0.01	
350	0.01	
355	0.01	
360	0.01	
365	0.01	
370	0.01	
375	0.01	
380	0.01	0.1
385	0.013	0.13
390	0.025	0.25
395	0.05	0.5
400	0.10	1.0
405	0.20	2.0
410	0.40	4.0
415	0.80	8.0
420	0.90	9.0
425	0.95	9.5
430	0.98	9.8
435	1.00	10.0
440	1.00	10.0
445	0.97	9.7
450	0.94	9.4
455	0.90	9.0

IEC 62471			
Clause	Requirement + Test	Result - Remark	Verdict

Table 4.2	Spectral weighting functions for assessing retinal hazards from broadband optical sources	P

Wavelength nm	**Blue-light hazard function B (λ)**	**Burn hazard function R (λ)**
460	0.80	8.0
465	0.70	7.0
470	0.62	6.2
475	0.55	5.5
480	0.45	4.5
485	0.40	4.0
490	0.22	2.2
495	0.16	1.6
500-600	$10^{[(450-\lambda)/50]}$	1.0
600-700	0.001	1.0
700-1050		$10^{[(700-\lambda)/500]}$
1050-1150		0,2
1150-1200		$0.2 \cdot 10^{0,02(1150-\lambda)}$
1200-1400		0.02

IEC 62471			
Clause	Requirement + Test	Result - Remark	Verdict

Table 5.4	Summary of the ELs for the surface of the skin or cornea (irradiance based values)	P

Hazard Name	**Relevant equation**	**Wavelength range nm**	**Exposure duration sec**	**Limiting aperture rad (deg)**	**EL in terms of constant irradiance $W \cdot m^{-2}$**
Actinic UV skin & eye	$E_S = \sum E_\lambda \cdot S(\lambda) \cdot \Delta\lambda$	200 – 400	< 30000	1.4 (80)	30/t
Eye UV-A	$E_{UVA} = \sum E_\lambda \cdot \Delta\lambda$	315 – 400	≤1000 >1000	1.4 (80)	10000/t 10
Blue-light small source	$E_B = \sum E_\lambda \cdot B(\lambda) \cdot \Delta\lambda$	300 – 700	≤100 >100	< 0.011	100/t 1.0
Eye IR	$E_{IR} = \sum E_\lambda \cdot \Delta\lambda$	780 –3000	≤1000 >1000	1.4 (80)	$18000/t^{0.75}$ 100
Skin thermal	$E_H = \sum E_\lambda \cdot \Delta\lambda$	380 – 3000	< 10	2π sr	$20000/t^{0.75}$

Table 5.5	Summary of the ELs for the retina (radiance based values)	P

Hazard Name	**Relevant equation**	**Wavelength range nm**	**Exposure duration sec**	**Field of view radians**	**EL in terms of constant radiance $W \cdot m^{-2} \cdot sr^{-1}$)**
Blue light	$L_B = \sum L_\lambda \cdot B(\lambda) \cdot \Delta\lambda$	300 – 700	0.25 – 10 10-100 100-10000 ≥ 10000	$0.011 \cdot \sqrt{(t/10)}$ 0.011 $0.0011 \cdot \sqrt{t}$ 0.1	$10^6/t$ $10^6/t$ $10^6/t$ 100
Retinal thermal	$L_R = \sum L_\lambda \cdot R(\lambda) \cdot \Delta\lambda$	380 – 1400	< 0.25 0.25 – 10	0.0017 $0.011 \cdot \sqrt{(t/10)}$	$50000/(\alpha \cdot t^{0.25})$ $50000/(\alpha \cdot t^{0.25})$
Retinal thermal (weak visual stimulus)	$L_{IR} = \sum L_\lambda \cdot R(\lambda) \cdot \Delta\lambda$	780 – 1400	> 10	0.011	6000/α

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict

Table 6.1	**Emission limits for risk groups of continuous wave lamps**									P
CLU048-1818C4-203M2K1										
Risk	Action spectrum	Symbol	Units	Emission Measurement						
				Exempt		Low risk		Mod risk		
				Limit	Result	Limit	Result	Limit	Result	
Actinic UV	$S_{UV}(\lambda)$	E_s	$W \cdot m^{-2}$	0.001	0.00013	0.003	N/A	0.03	N/A	
Near UV		E_{UVA}	$W \cdot m^{-2}$	10	0.011	33	N/A	100	N/A	
Blue light	B(λ)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	3920	10000	3290	4000000	N/A	
Blue light, small source	B(λ)	E_B	$W \cdot m^{-2}$	1.0*	N/A	1.0	N/A	400	N/A	
Retinal thermal	R(λ)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α = 280000	88800	28000/α	N/A	71000/α	N/A	
Retinal thermal, weak visual stimulus**	R(λ)	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	6000/α	N/A	6000/α	N/A	6000/α	N/A	
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	7.0	570	N/A	3200	N/A	
* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian. ** Involves evaluation of non-GLS source										

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict

Table 6.1	**Emission limits for risk groups of continuous wave lamps**									P
CLU046-1818C1-653Mzab										
Risk	Action spectrum	Symbol	Units	Emission Measurement						
				Exempt		Low risk		Mod risk		
				Limit	Result	Limit	Result	Limit	Result	
Actinic UV	$S_{UV}(\lambda)$	E_s	$W \cdot m^{-2}$	0.001	0.0005	0.003	N/A	0.03	N/A	
Near UV		E_{UVA}	$W \cdot m^{-2}$	10	0.044	33	N/A	100	N/A	
Blue light	B(λ)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	28400	10000	307000	4000000	29900	
Blue light, small source	B(λ)	E_B	$W \cdot m^{-2}$	1.0*	N/A	1.0	N/A	400	N/A	
Retinal thermal	R(λ)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α = 297872	3610000	28000/α = 297872	3610000	71000/α = 755319	348000	
Retinal thermal, weak visual stimulus**	R(λ)	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	6000/α	N/A	6000/α	N/A	6000/α	N/A	
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	2.1	570	N/A	3200	N/A	
* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian. ** Involves evaluation of non-GLS source										

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict

Table 6.1	**Emission limits for risk groups of continuous wave lamps**									P
CLU056-3618C1-653Mzab										
Risk	Action spectrum	Symbol	Units	Emission Measurement						
				Exempt		Low risk		Mod risk		
				Limit	Result	Limit	Result	Limit	Result	
Actinic UV	$S_{UV}(\lambda)$	E_s	$W \cdot m^{-2}$	0.001	0.00032	0.003	N/A	0.03	N/A	
Near UV		E_{UVA}	$W \cdot m^{-2}$	10	0.13	33	N/A	100	N/A	
Blue light	B(λ)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	22800	10000	30900	4000000	26600	
Blue light, small source	B(λ)	E_B	$W \cdot m^{-2}$	1.0*	N/A	1.0	N/A	400	N/A	
Retinal thermal	R(λ)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α = 280000	358000	28000/α = 280000	358000	71000/α = 710000	307000	
Retinal thermal, weak visual stimulus**	R(λ)	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	6000/α	N/A	6000/α	N/A	6000/α	N/A	
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	10.1	570	N/A	3200	N/A	
* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian. ** Involves evaluation of non-GLS source										

IEC62471A – ATTACHMENT 1			
Clause	Requirement + Test	Result - Remark	Verdict

ATTACHMENT TO TEST REPORT IEC 62471 **EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES** Photobiological safety of lamps and lamps systems	
Differences according to.....:	EN 62471:2008
Attachment Form No.....:	EU_GD_IEC62471A
Attachment Originator .....:	IMQ S.p.A.
Master Attachment .....:	2009-07
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	CENELEC COMMON MODIFICATIONS (EN)		P
4	**EXPOSURE LIMITS**		P
	Contents of the whole Clause 4 of IEC 62471:2006 moved into a new informative Annex ZB		—
	Clause 4 replaced by the following:		P
	Limits of the Artificial Optical Radiation Directive (2006/25/EC) have been applied instead of those fixed in IEC 62471:2006	See appended Table 6.1	P
4.1	General		P
	First paragraph deleted		—

IEC62471A – ATTACHMENT 1			
Clause	Requirement + Test	Result – Remark	Verdict

Table 6.1	**Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC)**								P
CLU048-1818C4-203M2K1									
Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	$S_{UV}(\lambda)$	E_s	$W \cdot m^{-2}$	0.001	0.00013	-	-	-	-
Near UV		E_{UVA}	$W \cdot m^{-2}$	0.33	0.011	-	-	-	-
Blue light	B(λ)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	3920	10000	3290	4000000	N/A
Blue light, small source	B(λ)	E_B	$W \cdot m^{-2}$	0.01*	N/A	1.0	N/A	400	N/A
Retinal thermal	R(λ)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α = 280000	88800	28000/α	N/A	71000/α	N/A
Retinal thermal, weak visual stimulus**	R(λ)	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	545000 0.0017≤ α ≤ 0.011	N/A				
				6000/α 0.011≤ α ≤ 0.1	N/A				
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	7.0	570	N/A	3200	N/A

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.
** Involves evaluation of non-GLS source

NOTE The action functions: see Table 4.1 and Table 4.2
The applicable aperture diameters: see 4.2.1
The limitations for the angular subtenses: see 4.2.2
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

IEC62471A – ATTACHMENT 1			
Clause	Requirement + Test	Result – Remark	Verdict

Table 6.1	**Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC)**								P
CLU046-1818C1-653Mzab									
Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	$S_{UV}(\lambda)$	E_s	$W \cdot m^{-2}$	0.001	0.0005	-	-	-	-
Near UV		E_{UVA}	$W \cdot m^{-2}$	0.33	0.044	-	-	-	-
Blue light	$B(\lambda)$	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	28400	10000	307000	4000000	29900
Blue light, small source	$B(\lambda)$	E_B	$W \cdot m^{-2}$	0.01*	N/A	1.0	N/A	400	N/A
Retinal thermal	$R(\lambda)$	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α = 297872	3610000	28000/α = 297872	3610000	71000/α = 755319	348000
Retinal thermal, weak visual stimulus**	$R(\lambda)$	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	545000 0.0017≤ α ≤ 0.011	N/A				
				6000/α 0.011≤ α ≤ 0.1	N/A				
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	2.1	570	N/A	3200	N/A

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.
** Involves evaluation of non-GLS source

NOTE The action functions: see Table 4.1 and Table 4.2
The applicable aperture diameters: see 4.2.1
The limitations for the angular subtenses: see 4.2.2
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

IEC62471A – ATTACHMENT 1			
Clause	Requirement + Test	Result – Remark	Verdict

Table 6.1	**Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC)**								P
CLU056-3618C1-653Mzab									
Risk	Action spectrum	Symbol	Units	Emission Measurement					
				Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	$S_{UV}(\lambda)$	E_s	$W \cdot m^{-2}$	0.001	0.00032	-	-	-	-
Near UV		E_{UVA}	$W \cdot m^{-2}$	0.33	0.13	-	-	-	-
Blue light	B(λ)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	22800	10000	30900	4000000	26600
Blue light, small source	B(λ)	E_B	$W \cdot m^{-2}$	0.01*	N/A	1.0	N/A	400	N/A
Retinal thermal	R(λ)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α = 280000	358000	28000/α = 280000	358000	71000/α = 710000	307000
Retinal thermal, weak visual stimulus**	R(λ)	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	545000 0.0017≤ α ≤ 0.011	N/A				
				6000/α 0.011≤ α ≤ 0.1	N/A				
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	10.1	570	N/A	3200	N/A

* Small source defined as one with α < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.

** Involves evaluation of non-GLS source

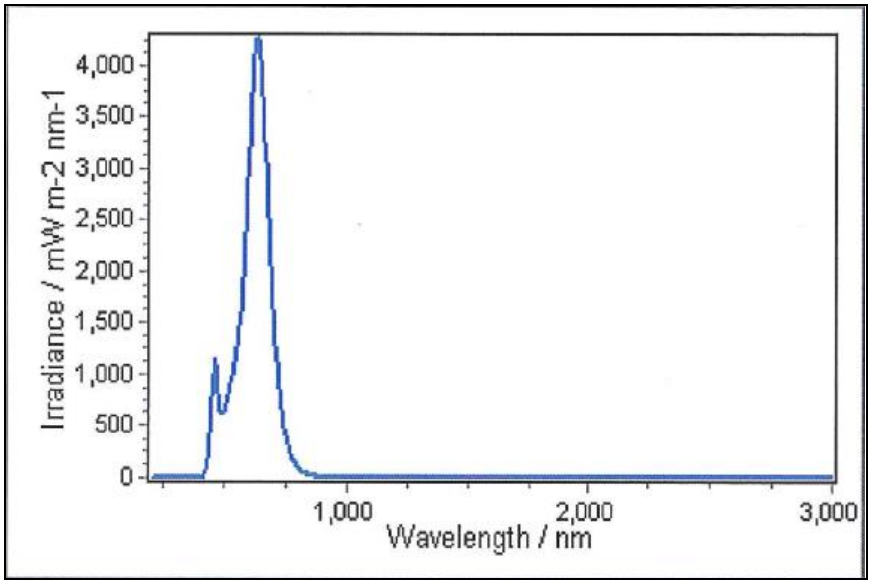
NOTE The action functions: see Table 4.1 and Table 4.2
The applicable aperture diameters: see 4.2.1
The limitations for the angular subtenses: see 4.2.2
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

IEC62471A – ATTACHMENT 2			
Clause	Requirement + Test	Result - Remark	Verdict

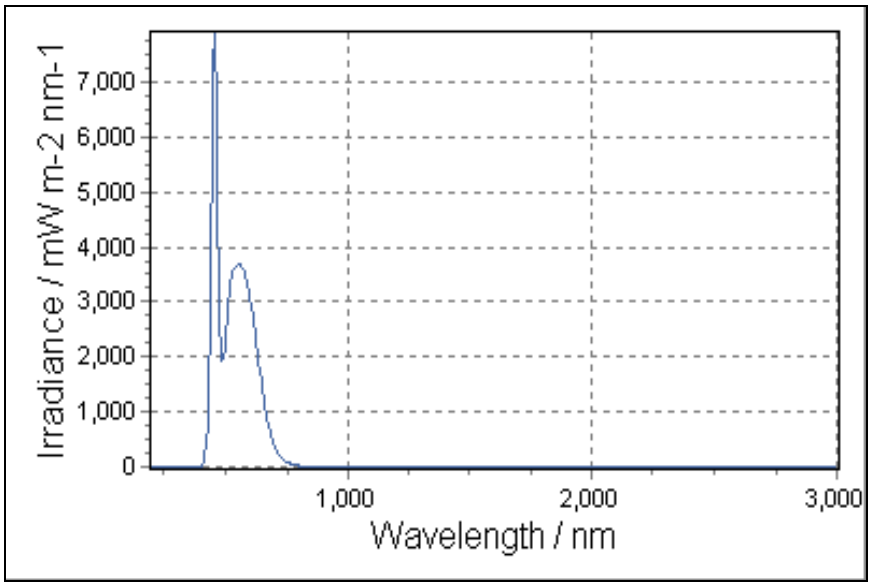
Furthermore remarks:

1. Spectra

Irradiance measurement:
- CLU048-1818C4-203M2K1

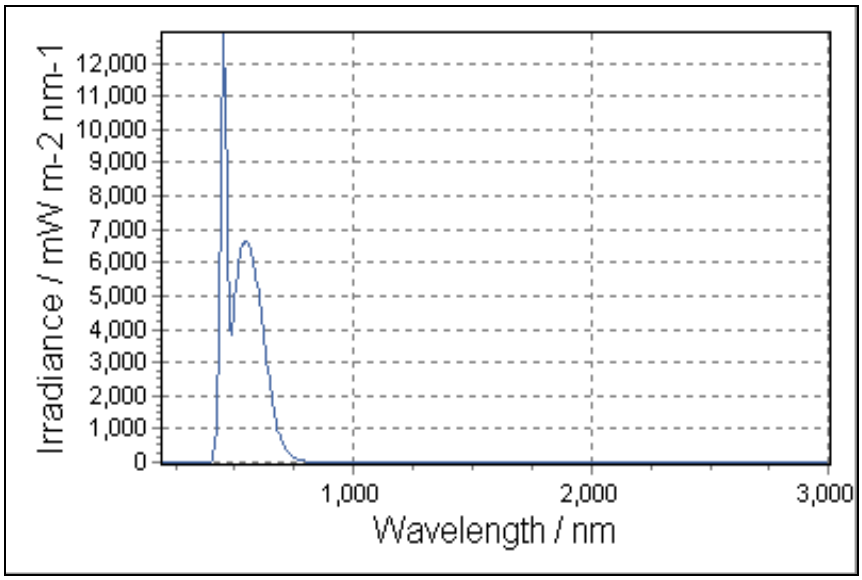


- CLU046-1818C1-653Mzab

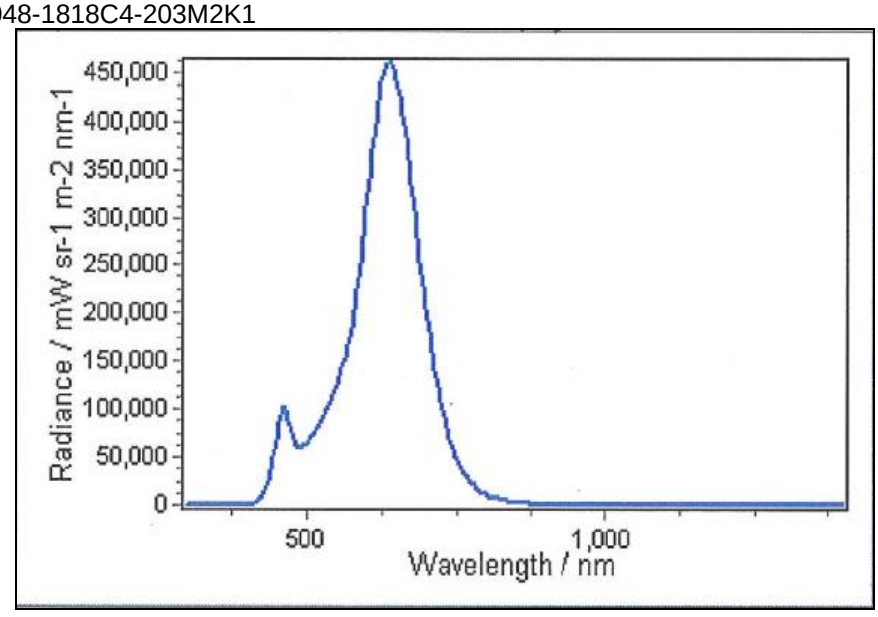


IEC62471A – ATTACHMENT 2			
Clause	Requirement + Test	Result - Remark	Verdict

- CLU056-3618C1-653Mzab

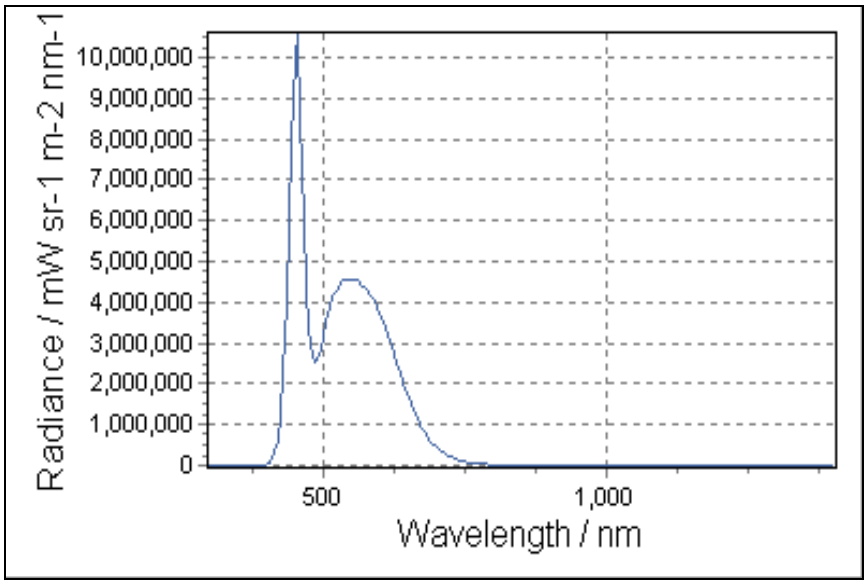


Radiance measurement:
- CLU048-1818C4-203M2K1

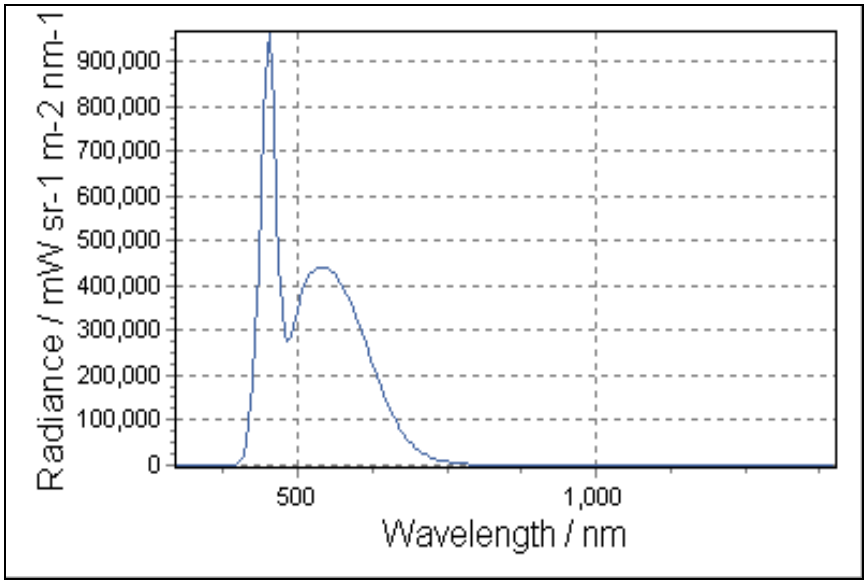


IEC62471A – ATTACHMENT 2			
Clause	Requirement + Test	Result - Remark	Verdict

- CLU046-1818C1-653Mzab



- CLU056-3618C1-653Mzab



Test Report issued under the responsibility of:

TÜVRheinland®

TEST REPORT
IEC TR 62778
Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires

Report Number..... :	50039435 002
Date of issue ..... :	(see IEC 62471 report)
Total number of pages ..... :	(see IEC 62471 report)
Name of Testing Laboratory preparing the Report..... :	(see IEC 62471 report)
Applicant's name ..... :	(see IEC 62471 report)
Address..... :	(see IEC 62471 report)
Test specification:	
Standard ..... :	IEC TR 62778:2014 (Second Edition)
Test procedure..... :	CB scheme
Non-standard test method..... :	N/A
Test Report Form No. ..... :	IEC62778A
Test Report Form(s) Originator.... :	TÜV SÜD Product Service GmbH
Master TRF ..... :	Dated 2016-02

If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

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Test item description .....:		(see IEC 62471 report)	
Trade Mark .....:		(see IEC 62471 report)	
Manufacturer.....:		(see IEC 62471 report)	
Model/Type reference.....:		(see IEC 62471 report)	
Ratings .....:		(see IEC 62471 report)	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):			
☒	**CB Testing Laboratory:**	TÜV Rheinland Japan Ltd., Yokohama Laboratory	
Testing location/ address ..... :		Global Technology Assessment Center (GTAC), 4-25-2 Kita-Yamata, Tsuzuki-ku, Yokohama 224-0021, Japan	
☐	**Associated CB Testing Laboratory:**		
Testing location/ address ..... :			
Tested by (name, function, signature) ..... :		(see IEC 62471 report)	
Approved by (name, function, signature) .. :		(see IEC 62471 report)	
☐	**Testing procedure: CTF Stage 1:**		
Testing location/ address ..... :			
Tested by (name, function, signature) ..... :			
Approved by (name, function, signature) .. :			
☐	**Testing procedure: CTF Stage 2:**		
Testing location/ address ..... :			
Tested by (name + signature)..... :			
Witnessed by (name, function, signature) . :			
Approved by (name, function, signature) .. :			
☐	**Testing procedure: CTF Stage 3:**		
☐	**Testing procedure: CTF Stage 4:**		
Testing location/ address ..... :			
Tested by (name, function, signature) ..... :			
Witnessed by (name, function, signature) . :			
Approved by (name, function, signature) .. :			
Supervised by (name, function, signature) :			

List of Attachments (including a total number of pages in each attachment):

(none)

Summary of testing:

Tests performed (name of test and test clause):	**Testing location:**
7. MEASUREMENT INFORMATION FLOW 8. RISK GROUP CLASSIFICATION Models below were assessed as representing the worst case in terms of LED package illuminance, density and spectrum in regard to the hazards identified in this standard. <Assessed models> CLU048-1818C4-653Mzabcdef, CLU058-3618C4-653Mzabcdef, CLU046-1818C1-653Mzab, CLU056-3618C1-653Mzab (Assessment data from TUV CB test report No. 50031066 001)	(see IEC 62471 report)

Summary of compliance with National Differences (List of countries addressed):

(none)

Copy of marking plate:

(none)

Test item particulars ..... :	
Product evaluated ..... :	☒ **LED package** ☐ **LED module** ☐ **Lamp** ☐ **Luminaire**
Rated voltage (V) ..... :	(see page 8-9)
Rated current (mA) ..... :	(see page 8-9)
Rated CCT (K) ..... :	(see page 8-9)
Rated Luminance (Mcd/m^2) ..... :	N/A, Luminous flux rated. (see page 8-9)
Component report data used ..... :	☒ **Not applicable** ☐ **LED package** ☐ **LED module** ☐ **Lamp**
Possible test case verdicts:	
- test case does not apply to the test object.....:	N/A
- test object does meet the requirement .....:	P (Pass)
- test object does not meet the requirement.....:	F (Fail)
Testing .....:	
Date of receipt of test item .....:	(see IEC 62471 report)
Date (s) of performance of tests.....:	(see IEC 62471 report)
General remarks:	
"(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. **Throughout this report a ☐ comma / ☒ point is used as the decimal separator.**	
Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided ..... :	☒ **Yes** ☐ **Not applicable**
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies).....:	(see IEC 62471 report)
General product information: (see IEC 62471 report)	

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Clause	Requirement + Test	Result - Remark	Verdict

7	**MEASUREMENT INFORMATION FLOW**		**P**
7.1	**Basic flow**		**P**
	'Law of conservation of luminance' applied		P
	Use of only true luminance/radiance values		P
	In case of luminaire: The light source is operated in the luminaire under similar conditions as when tested as a component		N/A
	In case E_{thr} value for RG2 was established the peak value was derived from angular light distribution		P
7.2	**Conditions for the radiance measurement**		**P**
	Standard condition applied (200mm distance, 0,011rad field of view)	Test procedure according to IEC 62471.	P
	Non-standard condition applied		N/A
7.3	**Special cases (I): Replacement by a lamp or LED module of another type**		**N/A**
	Light source is a white light source		N/A
	Evaluation done based on highest luminance		N/A
	Evaluation done based on CCT value		N/A
7.4	**Special cases (II): Arrays and clusters of primary light sources**		**N/A**
	LED package is evaluated as .....:		N/A
	E_{thr} of LED package applies to array		N/A
8	**RISK GROUP CLASSIFICATION**		**P**
	Risk group achieved:		P
	-...Risk Group 0 unlimited		N/A
	-...Risk Group 1 unlimited		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- E_{thr} ..... (lx) : Distance to reach RG1..... (m) :	1) CLU048-1818C4-653Mzabcdef E_{thr}: 626 lx Distance to reach RG1: 6.74 m 2) CLU058-3618C4-653Mzabcdef E_{thr}: 639 lx Distance to reach RG1: 9.49 m 3) CLU046-1818C1-653Mzab E_{thr}: 956 lx Distance to reach RG1: 5.6 m 4) CLU056-3618C1-653Mzab E_{thr}: 903 lx Distance to reach RG1: 8.2 m	P

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Clause	Requirement + Test	Result - Remark	Verdict

	TABLE: Spectroradiometric measurement		**P**
	Measurement performed on:	☒ **LED package** ☐ **LED module** ☐ **Lamp** ☐ **Luminaire**	—
	Model number.....	1) CLU048-1818C4-653Mzabcdef 2) CLU058-3618C4-653Mzabcdef 3) CLU046-1818C1-653Mzab 4) CLU056-3618C1-653Mzab	—
	Test voltage (V).....	1) DC 59.6 2) DC 115.9 3) DC 63.7 4) DC 127	—
	Test current (mA)	4140	—
	Test frequency (Hz).....	N/A, DC supply	—
	Ambient, t (°C).....	22-24	—
	Measurement distance	☒ 20 cm ☐ ... cm	—
	Source size	☒ Non-small 1), 2), 4) α = 100.0 mrad 3) α = 94.0 mrad ☐ Small : .... mm	—
	Field of view	☐ 100 mrad ☒ 11 mrad ☐ 1,7 mrad (for small sources)	—

Item	Sym-bol	Units	Result	Remark
Correlated colour temperature	CCT	K	6500	From product specification
x/y colour coordinates			N/A	
Blue light hazard radiance	L_B	$W/(m^2 \cdot sr^1)$	1) 17900 2) 16700 3) 307000 4) 30900	Measured value
Blue light hazard irradiance	E_B	W/m^2	N/A	Non-small source
Luminance	L	cd/m^2	1) 11201663 2) 10664325 3) 293600969 4) 27889196	Measured value
Illuminance	E	lx	N/A	Non-small source
Supplementary information:				

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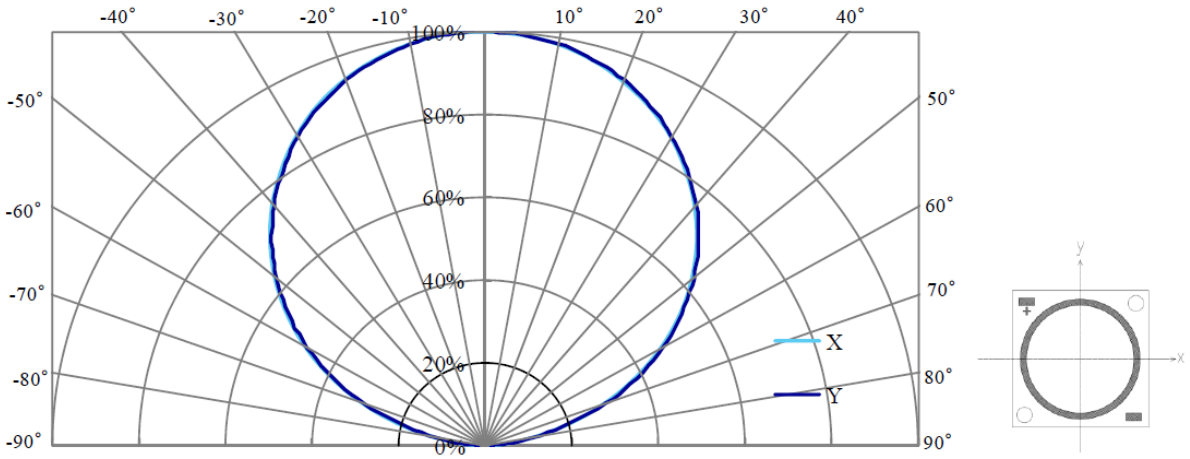
Clause	Requirement + Test	Result - Remark	Verdict

	TABLE: Angular light distribution	**P**

1) CLU048-1818C4-653Mzabcdef,
2) CLU058-3618C4-653Mzabcdef,
3) CLU046-1818C1-653Mzab,
4) CLU056-3618C1-653Mzab:



Based on characteristics above, most unfavorable condition of angle α is determined as 0°.