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**Philips Lighting B.V.**  
Optical Calibrations and Measurements  
Photobiological safety & Irradiance  
High Tech Campus 48, 5656 AE Eindhoven

E-mail: henk.jan.van.aalderen@philips.com

Report nr : JM10517  
Date of report : 24-Oct-2014  
Testfacility : VarOptr  
Operator : J.Marinus  
Responsible : H.J.v.Aalderen  
Meas type : PhotoBiological

## Photobiological safety evaluation report according to IEC 62471

Customer : Philips Lumileds Lighting Co LLC  
Address : 370 West Trimble Road| San Jose CA 95131USA  
Organisation : LumiLeds  
Invoice Id :

**Measuring Conditions**  
Spectral Range [nm] : 200-3000  
Date Of Meas : 21-Oct-2014  
Burning position : Horizontal  
Meas.dist. Irradiance [mm] : 200  
Meas.dist. Radiance [mm] : 200  
Ambient temperature [°C] : 25.1

**Lamp Data**  
Lamp type : LUXEON TX L1T2-6570  
  
Lamp nr : Sample 0002  
Life time [h] : 0  
Gear :  
Description : PHILIPS Lumileds Lighting Company BV  
Reporting distance : 200 mm (at 3095 lx)



**Risk Categories Found (at reporting distance)**  
Hazards  
Actinic UV : Exempt  
Near UV : Exempt  
Retinal Blue SmallSrc : RiskGroup 2  
Retinal thermal : Exempt  
InfraRed Eye : Exempt  
Thermal Skin : pass  
:

Summary of evaluated Hazards : The product classified as Riskgroup 2 based on the reported Photobiological safety tests

**Remarks** : L1T2-6570-x x y y s 0 0 0 0 z z z 0 is part of the product family LUXEON TX. The sample measured, L1T2-6570, is ANSI bin 6500K. The present classification is thus valid for all LUXEON TX from CCT bins equal or lower than 6500K as e.g. L1T2-5770-x x y y s 0 0 0 0 z z z 0 (see TR IEC62778).

**Tested By:** J.Marinus  
  
Signatures:  
  
Technical assistant

**Approved By:** H.J.v.Aalderen  
  
Signatures:  
  
Head of Photobiological safety & Irradiance

notes: (1) RVA declaration of accreditation available at:  
[http://www.rva.nl/uri/?uri=AMGATE\\_10218\\_1\\_TICH\\_R11753221190060](http://www.rva.nl/uri/?uri=AMGATE_10218_1_TICH_R11753221190060)



## Photobiological safety evaluation report according to IEC 62471

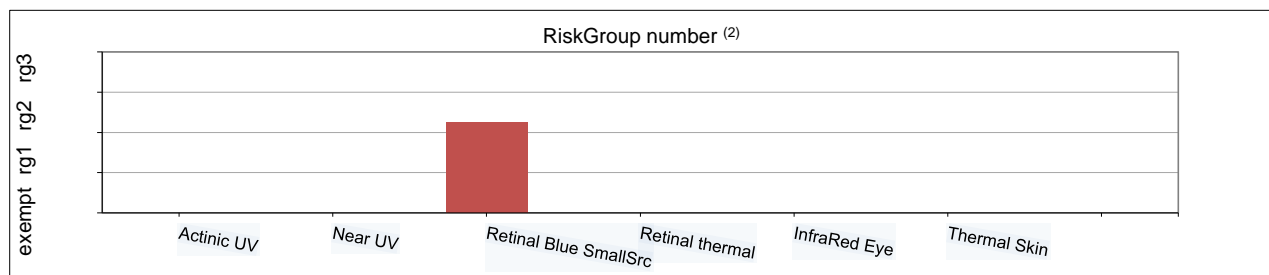
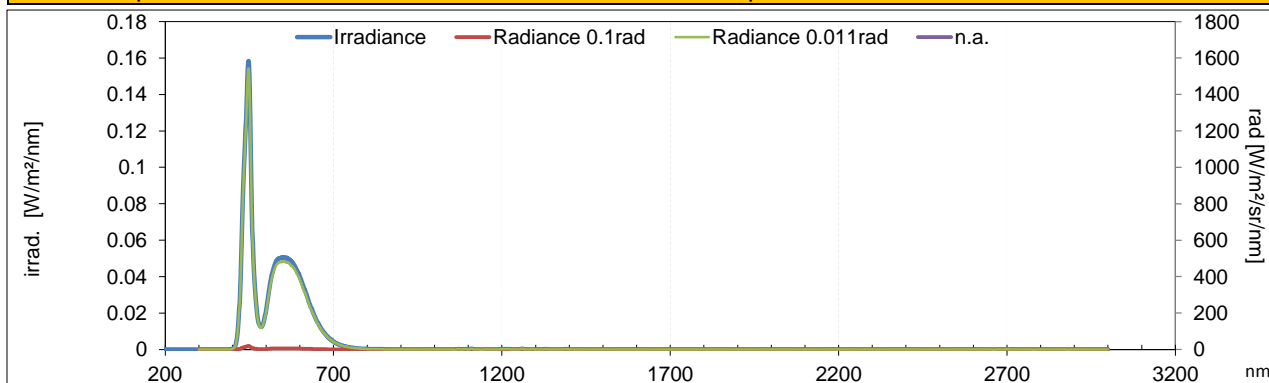
Lamp Data		Measuring Conditions	
Lamp type	: LUXEON TX L1T2-6570	Spectral Range [nm]	: 200-3000
Lamp nr	: Sample 0002	Date Of Meas	: 21-Oct-2014
Life time [h]	: 0	Ambient temperature [°C]	: 25.1
Gear	:	Reference plane	: optical radiating center
Description	: PHILIPS Lumileds Lighting Company BV	Azimuth, Elevation [deg]	: 0 , 0
Source subtense $\alpha$ [rad]	: 0.0100	Electrical setting parameter	: Lamp Current DC
Appar.Src.Size [mm]	: 2.00	Meas.dist. Irradiance [mm]	: 200
Reporting distance	: 200 mm (at 3095 lx)	Meas.dist. Radiance [mm]	: 200

**Remarks**

Measured electrical quantities		Rated		Calculated photometric quantities <sup>(1)</sup>	
U lamp	: 3.167	n/a	V	illuminance	: 3095.1 lx ( $\pm 5.8\%$ )
I lamp	: 1.200	1.200	A	Chromaticity x,y	: 0.281 0.264
P lamp	: 3.799	n/a	W	Colour temperature	: 11861 K
	:			Colour rendition avg8	: 76

Hazards at viewing distance	Emission Level	Emission Limit for Rg2	Uncertainty Emission Level (k=2) [%]	Emission Level Unit	RiskGroup number <sup>(2)</sup>	RiskGroup	RG certainty <sup>(4)</sup> [%]	Emission Hazard Value <sup>(3)</sup>
Actinic UV	: 4.22e-8	0.03	22.0	W/m <sup>2</sup>	0	Exempt	100	0.00
Near UV	: 0.0011	100	6.4	W/m <sup>2</sup>	0	Exempt	100	0.00
Retinal Blue SmallSrc	: 4.48	400	6.0	W/m <sup>2</sup>	2.25	RiskGroup 2	100	0.01
Retinal thermal	: 4.91e+5	7100100	6.0	W/m <sup>2</sup> /sr	0	Exempt	100	0.07
InfraRed Eye	: < 0.068 <sup>(5)</sup>	3200		W/m <sup>2</sup>	0	Exempt	100	
Thermal Skin	: 11.5	3556.6	6.2	W/m <sup>2</sup>	0	pass	100	0.00

**Found: RiskGroup 2** **verdict: passed**



- notes :
- (1) from irradiance spectrum, for information only
  - (2) logarithmic interpolated inter Riskgroup number
  - (3) ratio 'Emission Level' / 'Emission Limit'
  - (4) Probability the Riskgroup classification is at most as indicated
  - (5) Signal below detection limit, emission level is below given value with uncertainty 3%



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## Photobiological safety IEC 62471 results summary

Clause	Requirement + Test		Result - Remark						Verdict
<b>Table 6.1</b>	Emission limits for risk groups of continuous wave lamps							Pass	
Risk	Action spectrum	Symbol	Units	Exempt		Emission-Measurement		Mod.risk	
				Result	Limit	Result	Limit	Result	Limit
Actinic UV	Suv( $\lambda$ )	E <sub>s</sub>	W/m <sup>2</sup>	4.22e-8	0.001		0.003		0.03
Near UV		E <sub>UVA</sub>	W/m <sup>2</sup>	0.0011	10		33		100
Retinal Blue small source	B( $\lambda$ )	E <sub>B</sub>	W/m <sup>2</sup>		1.0*		1.0	4.48	400
Retinal thermal	R( $\lambda$ )	L <sub>R</sub>	W/m <sup>2</sup> /sr	5940	2800023	4.91e+5	2800023		7100059
InfraRed Eye***		E <sub>IR</sub>	W/m <sup>2</sup>	< 0.068 ***	100		570		3200
Thermal Skin		E <sub>H</sub>	W/m <sup>2</sup>	11.5	35566				
* Small source defined as one with $\alpha < 0.011$ radian. Averaging field of view at 10000 s is 0.1 radian ** Involves evaluation of non-GLS source. *** Signal below detection limit, emission level is below given value with uncertainty 3%									



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**ATTACHMENT TO TEST REPORT IEC 62471**  
**EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES.**  
**Differences according to EN 62471:2008**

Clause	Requirement + Test		Result - Remark							Verdict
<b>Table 6.1</b>	Emission limits for risk groups of continuous wave lamps									Pass
Risk	Action spectrum	Symbol	Units	Emission-Measurement						RG
				Exempt		Low-risk		Mod.risk		
				Result	Limit	Result	Limit	Result	Limit	
Actinic UV	Suv( $\lambda$ )	E <sub>s</sub>	W/m <sup>2</sup>	4.22e-8	0.001		0.003		0.03	0
Near UV		E <sub>UVA</sub>	W/m <sup>2</sup>	0.0011	10		33.333		100	0
Retinal Blue small source*	B( $\lambda$ )	E <sub>B</sub>	W/m <sup>2</sup>		0.01****		1.000	4.48	400	2
Retinal thermal	R( $\lambda$ )	L <sub>R</sub>	W/m <sup>2</sup> /sr	5940	2811730	4.91e+5	2811730		7071127	0
InfraRed Eye		E <sub>IR</sub>	W/m <sup>2</sup>	< 0.068 ***	101.2		569.2		3200.9	0
Thermal Skin		E <sub>H</sub>	W/m <sup>2</sup>	11.5	35566					0
* Small source defined as one with $\alpha < 0.011$ radian. Averaging field of view at 10000 s is 0.1 radian										
** Involves evaluation of non-GLS source.										
*** Signal below detection limit, emission level is below given value with uncertainty 3%										
**** Limit for steady fixation of very small sources with angular subtense < 11 mrad. Due to eye movements during normal visual task the limit without eye stabilization is rather 1 W/m <sup>2</sup>										

Summary of evaluated Hazards : The product classified as Riskgroup 2 based on Photobiological safety tests according to EN 62471



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## Blue light hazard assessment according to IEC/TR 62778 <sup>(1)</sup>

### Measuring Conditions

Spectral Range	: 200-3000	[nm]
Reporting distance	: 200 mm (at 3095 lx)	[mm]
Smallest source subtense $\alpha$	: 0.0100	[rad]
Field of view (for assessment)	: 1.4000	[rad]

### Measurements

$L_{avg}$ average luminance over field of view	: Not applicable	[cd/m <sup>2</sup> ]
E Illuminance at reporting distance	: 3095.1	[lux]

### Assessment results

RiskGroup (Retinal blue light)	: Ethr for Rg2	
$E_{thr}$ threshold illuminance where source is at riskgroup 2 limit	: 690.92	[lux]
$d_{min}$ threshold distance where source is at riskgroup 2 limit ( $E = E_{thr}$ )	: 0.41	[m]
$L_B$ blue light weighted radiance	: Not applicable	[W/m <sup>2</sup> /sr]
$E_B$ blue light weighted Irradiance	: 4.4796	[W/m <sup>2</sup> ]
$K_{B,v}$ blue light hazard efficacy of luminous radiation	: 1.4473	[mW/lm]
$\eta_B$ blue light hazard efficiency of radiation	: 0.3902	

### Remarks

Field Of View overfills the light source. Falling back to Retinal Blue small source hazard

note: (1) Results shown on this page are not within RvA accreditation scope

page 5 of 9



**Assumptions, anomalies and warnings**

Possible product label text

CAUTION

Possibly hazardous optical radiation emitted from this product Do not stare at operating lamp. May be harmful to the eyes.

Assumptions

Spatially uniform irradiance distribution (not a beam)

Continuous wave Lamp (not pulsed)

High Luminance of source (> 10000 cd/m<sup>2</sup>)

Anomalies (may cause unreliable results). Results are only for information if items are listed

Remarks



### Terms and Conditions

This evaluation report has been executed in accordance with the measurements standards as provided in the international standard CEI IEC 62471:2006 and Technical report IEC/TR 62471-2.

Deviation from the methods that are described in the standard CEI IEC 62471 will be expressed clearly in this report

On request of the customer, the reported parameters that are not defined in the standard CEI IEC 62471, will be explained by the test laboratory

This evaluation report is applicable only to the product which is unambiguously identified in the report

If the product has no identification, the test laboratory will compute and report an unique identification for the specimen tested.

The customer is at all times responsible for the (technical) information, such as optical properties, provided by him

Reproduction of the complete report is allowed. Parts of the report may only be reproduced with written approval of the test laboratory.

The test laboratory shall not hand over measurement data and evaluation report to other parties than the customer unless there is written approval of the customer

This evaluation report is issued under the restriction that the test laboratory will not be held liable for any (direct and/or consequential) damage resulting directly or indirectly from the test activities

The Raad voor Accreditatie (RvA) is a member of the European Co-operation for Accreditation (EA) and is one of the signatories to the EA multilateral Agreement and to the ILAC Mutual Recognition Arrangements (MRA) for the mutual recognition of test reports



The Dutch Accreditation Council RvA, by law appointed as the national accreditation body for The Netherlands, hereby declares that accreditation has been granted to:

**Philips Lighting B.V.  
Optical Calibrations and Measurements  
Eindhoven**

The organisation has demonstrated to be able to generate technical valid results in a competent way and work according to a management system.

This accreditation is based on an assessment against the requirements as laid down in ISO/IEC 17025:2005.

The accreditation covers the activities as specified in the authorized annex bearing the registration number.

The accreditation is valid provided that the organisation continues to meet the requirements.

The accreditation with registration number:

**L 533**

is granted on 29 August 2012

This declaration is valid until  
**1 September 2016**

The accreditation has been granted for the first time on  
**29 August 2012**

The Chief Executive

Ir. J.C. van der Poel



Annex to ISO/IEC 17025 declaration of accreditation  
for registration number: L 533



of **Philips Lighting B.V.**  
**Optical Calibrations and Measurements**  
**Eindhoven**

This annex is valid from: **29-08-2012** to **01-09-2016**

Replaces annex dated: **n.a.**

Premises: **Eindhoven**

No.	Material or product	Type of activity	Internal reference number
1	Lamps and lamp systems	Spectral, optical measurements in the wavelength range from 200 nm through 3000 nm for the evaluation of photo biological safety.	WI04 in accordance with CEI IEC 62471 and IEC/TR 62471-2 <sup>1</sup>

IEC/TR 62471-2<sup>1</sup>: with the exception of pulsed lamps and lamps systems (par. 6.2)

This annex has been approved by:

A handwritten signature in blue ink, appearing to read "J.C. van der Poel", is written over a dotted rectangular box.

Ir. J.C. van der Poel  
Chief Executive