Philips Electronics Nederland B.V.
Optical Calibrations and Measurements
Spectroradiometry
Mathildelaan 1, 5611 BD Eindhoven

Tel: +31 615900698 E-mail: h.stel@philips.com

Report nr	: hj10372
Date of report	: 24-okt-2013
Testfacility	: EEA-622
Operator	: J.Marinus
Responsible	: H.H.Stel
Meas type	: PhotoBiological

Photobiological safety evaluation report according to IEC 62471

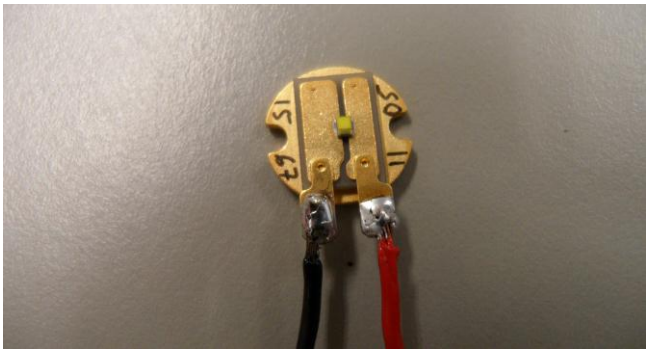
Customer	: Philips Lumileds Lighting Co LLC
Address	: 370 West Trimble Road San Jose, CA 95131, USA
Organisation	: Lumileds
Invoice Id	:

Measuring Conditions

Spectral Range [nm]	: 200-3000
Date Of Meas	: 03-sep-2013
Burning position	: Horizontal
Meas.dist. Irradiance [mm]	: 200
Meas.dist. Radiance [mm]	: 200
Ambient temperature [°C]	: 24.5

Lamp Data

Lamp type	: LUXEON Z-LXZ1-6565
Lamp nr	: 1105 1567
Life time [h]	: 0
Gear	:
Description	: PHILIPS Lumileds Lighting Company BV
Reporting distance	: as measured (at 2070 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
	:

Remarks : LXZ1-6565 is part of the product family LUXEON Z. The sample measured, LXZ1-6565, is ANSI bin 6500K. The present classification is thus valid (worst case) for all LUXEON Z from CCT bins equal or lower than 6500K as e.g. LXZ1-5770 (see TR IEC62778).

Signed by : H.H.Stel **Signature :**

Head of Photobiological safety & Irradiance

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Software Version	: 1.5.7.0

Photobiological safety evaluation report according to IEC 62471

Lamp Data

Lamp type	:	LUXEON Z-LXZ1-6565
Lamp nr	:	1105 1567
Life time [h]	:	0
Gear	:	
Description	:	PHILIPS Lumileds Lighting Company BV
Source subtense α [rad]	:	0.0047
Appar.Src.Size [mm]	:	0.95
Reporting distance	:	as measured (at 2070 lx)

Measuring Conditions

Spectral Range [nm]	:	200-3000
Date Of Meas	:	03-sep-2013
Ambient temperature [°C]	:	24.5
Reference plane	:	optical radiating center
Azimuth, Elevation [deg]	:	
Electrical setting parameter	:	Lamp Current DC
Meas.dist. Irradiance [mm]	:	200
Meas.dist. Radiance [mm]	:	200

Remarks

Measured electrical quantities

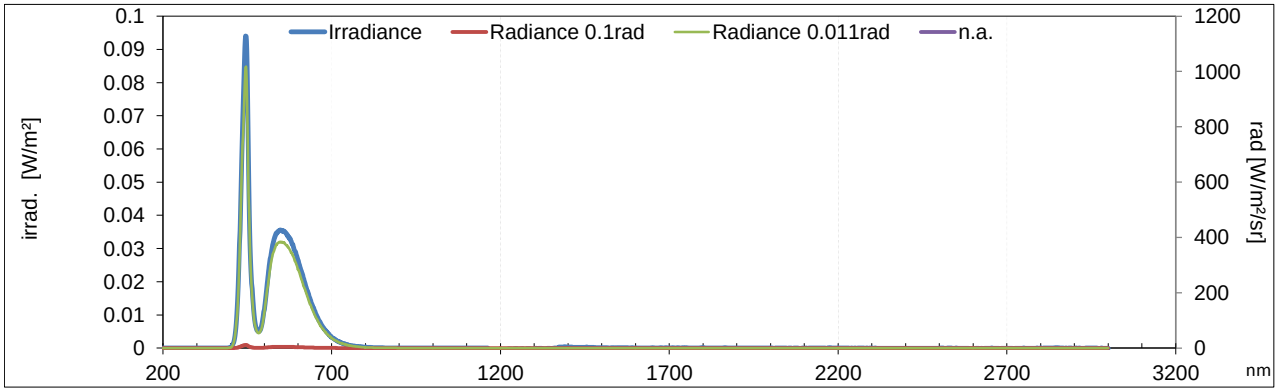
U lamp	:	3.170	V
I lamp	:	1.000	A
P lamp	:	3.171	W
	:		

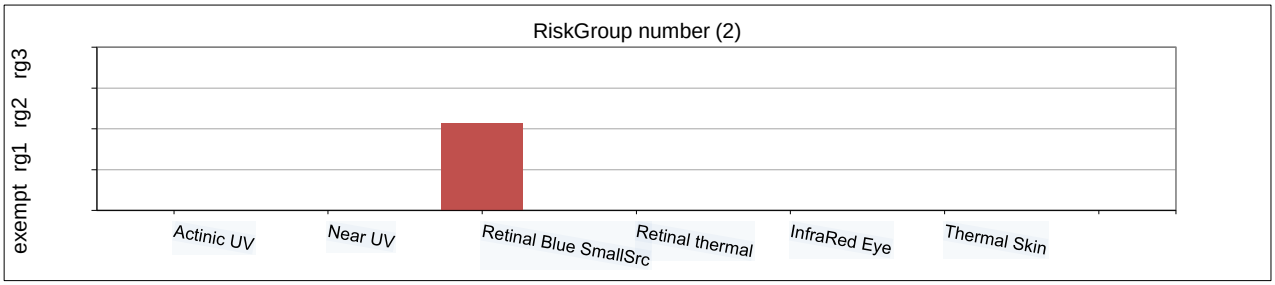
Calculated photometric quantities (1)

illuminance	:	2070.2	lx
Chromaticity x,y	:	0.298	0.292
Colour temperature	:	8106	K
Colour rendition avg8	:	70	

Hazards at viewing distance		Emission Level	Emission Limit for Rg2	Uncertainty Emission Level (k=2) [%]	Emission Level Unit	RiskGroup number (2)	RiskGroup	RG certainty [%] (4)	Emission Hazard Value (3)
Actinic UV	:	3.2e-8	0.03	21.2	W/m²	0	Exempt	100	0.00
Near UV	:	8.21e-4	100	4.9	W/m²	0	Exempt	100	0.00
Retinal Blue SmallSrc	:	2.46	400	4.2	W/m²	2.15	RiskGroup 2	100	0.01
Retinal thermal	:	3.08e+5	14947000	7.1	W/m²/sr	0	Exempt	100	0.02
InfraRed Eye	:	< 3.2 (5)	3200		W/m²	0	Exempt	100	
Thermal Skin	:	7.05	3556.6	42.1	W/m²	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 clasification 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
Table 6.1	Emission limits for risk groups of continuous wave lamps		Pass

Risk	Action spectrum	Symbol	Units	Emission-Measurement					
				Exempt		Low-risk		Mod.risk	
				Result	Limit	Result	Limit	Result	Limit
Actinic UV	SUV(λ)	E_s	W/m²	3.2e-8	0.001		0.003		0.03
Near UV		E_{UVA}	W/m²	8.21e-4	10.0		33.0		100
Retinal Blue SmallSrc*	B(λ)	E_B	W/m²		1.0*		1.0	2.46	400.0
Retinal thermal	R(λ)	L_R	W/m²/sr	3.08e+5	5894748	3.08e+5	5894748		14947397
InfraRed Eye		E_{IR}	W/m²	< 3.2 ***	100.0		570.0		3200
Thermal Skin		E_H	W/m²	7.05	35565.6				

* 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.
*** 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
Table 6.1	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(λ)	E_s	W/m²	3.2e-8	0.001		0.003		0.030	0
Near UV		E_{UVA}	W/m²	8.21e-4	10		33.3		100	0
Retinal Blue SmallSrc*	B(λ)	E_B	W/m²		0.01 ****		1.0	2.46	400	2
Retinal thermal	R(λ)	L_R	W/m²/sr	3.08e+5	5919394	3.08e+5	5919394		14886487	0
InfraRed Eye		E_{IR}	W/m²	< 3.2 ***	101.2		569.2		3200.9	0
Thermal Skin		E_H	W/m²	7.05	35565.6					0

* 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.

*** 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/m²

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Blue light hazard assessment according to IEC/TR 62778

Measuring Conditions

	Spectral Range	:	200-3000	[nm]
	Reporting distance	:	as measured (at 2070 lx)	[mm]
	Smallest source subtense α	:	0.0047	[rad]
	Field of view (for assessment)	:	1.4000	[rad]

Measurements

L_{avg}	average luminance over field of view	:	Not applicable	[cd/m^2]
E	Illuminance at reporting distance	:	2070.2	[lux]

Assessment results

	RiskGroup (Retinal blue light)	:	Ethr for Rg2	
E_{thr}	threshold illuminance where source is at riskgroup 2 limit	:	841.73	[lux]
d_{min}	threshold distance where source is at riskgroup 2 limit (E = E_{thr})	:	0.31	[m]
L_B	blue light weighted radiance	:	Not applicable	[W/m^2/sr]
E_B	blue light weighted Irradiance	:	2.4595	[W/m^2]
$K_{B,v}$	blue light hazard efficacy of luminous radiation	:	1.1880	[mW/lm]
η_B	blue light hazard efficiency of radiation	:	0.3476	

Remarks

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

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/m2)

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

Warnings

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

DUTCH ACCREDITATION COUNCIL RvA

PO Box 2768 NL-3500 GT Utrecht

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**

RAAD VOOR ACCREDITATIE

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[1]

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

This annex has been approved by:

Ir. J.C. van der Poel
Chief Executive