**Philips Innovation Services**
**Optical Calibrations and Measurements**
**Spectroradiometry**
**Mathildelaan 1, 5611 BD Eindhoven**

Tel: +31 40 27 55246 E-mail: h.stel@philips.com

| | |
|---|---|
| Report nr | : JM10335 |
| Date of report | : 19-jun-2013 |
| Testfacility | : OCM VIS-IR |
| Operator | : J.Marinus |
| Responsible | : H.H.Stel |
| Meas type | : PhotoBiological |

# Photobiological safety evaluation report according to IEC 62471

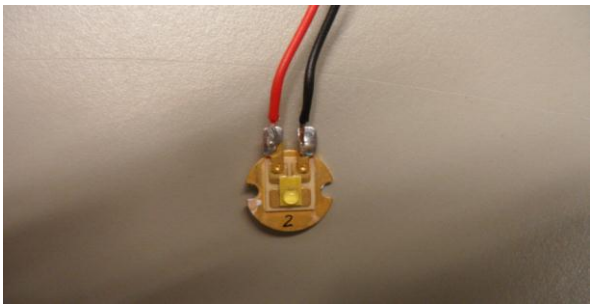
| | |
|---|---|
| Customer | : Philips Lumileds Lighting Co LLC |
| Address | : 370 West Trimble Road San Jose, CA 95131, USA |
| Organisation | : Lumileds |
| Invoice Id | : |

**Measuring Conditions**

| | |
|---|---|
| Spectral Range [nm] | : 200-1800 |
| Date Of Meas | : 12-jun-2013 |
| Burning position | : Horizontal |
| Meas.dist. Irradiance [mm] | : 200 |
| Meas.dist. Radiance [mm] | : 200 |
| Ambient temperature [°C] | : 25.8 |

**Lamp Data**

| | |
|---|---|
| Lamp type | : LUXEON Rebel PLUS |
| Lamp nr | : LX18-P150-2 |
| Life time | : 0 |
| Gear | : |
| Description | : PHILIPS Lumileds Lighting Company BV |
| Reporting distance | : 200 mm (at 2553 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@10 s |
| | : |

**Remarks** : LX18-P150 is part of the product family LUXEON Rebel PLUS. The sample measured, LX18-P150, is ANSI bin 5000K. The present classification is thus valid (worst case) for all LUXEON Rebel PLUS from CCT bins equal or lower than 5000K as e.g. LX18-P140 (see TR IEC62778).

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

(Head of Spectroradiometry)

notes: RVA declaration of accreditation available at: http://www.rva.nl/uri/?uri=AMGATE_10218_1_TICH_R11753221190060

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|---|---|
| Report nr | : JM10335 |
| Date of report | : 19-jun-13 |
| Testfacility | : EEA-622 |
| Operator | : J.Marinus |
| Responsible | : H.H.Stel |
| Software Version | : 1.5.3.0 |

# Photobiological safety evaluation report according to IEC 62471

**Lamp Data**

| | |
|---|---|
| Lamp type | : LUXEON Rebel PLUS |
| Lamp nr | : LX18-P150-2 |
| Life time [h] | : 0 |
| Gear | : |
| Description | : PHILIPS Lumileds Lighting Company BV |
| | : |
| Source subtense α [rad] | : 0.0075 |
| Appar.Src.Size [mm] | : 1.5 |
| Reporting distance | : 200 mm (at 2553 lx) |

**Measuring Conditions**

| | |
|---|---|
| Spectral Range [nm] | : 200-1800 |
| Date Of Meas | : 12-jun-13 |
| Ambient temperature [°C] | : 25.8 |
| Reference plane : | optical radiating center |
| Azimuth, Elevation [deg] | : |
| Meas.dist. Irradiance [mm] | : 200 |
| Meas.dist. Radiance [mm] | : 200 |

**Remarks**

**Measured electrical quantities**

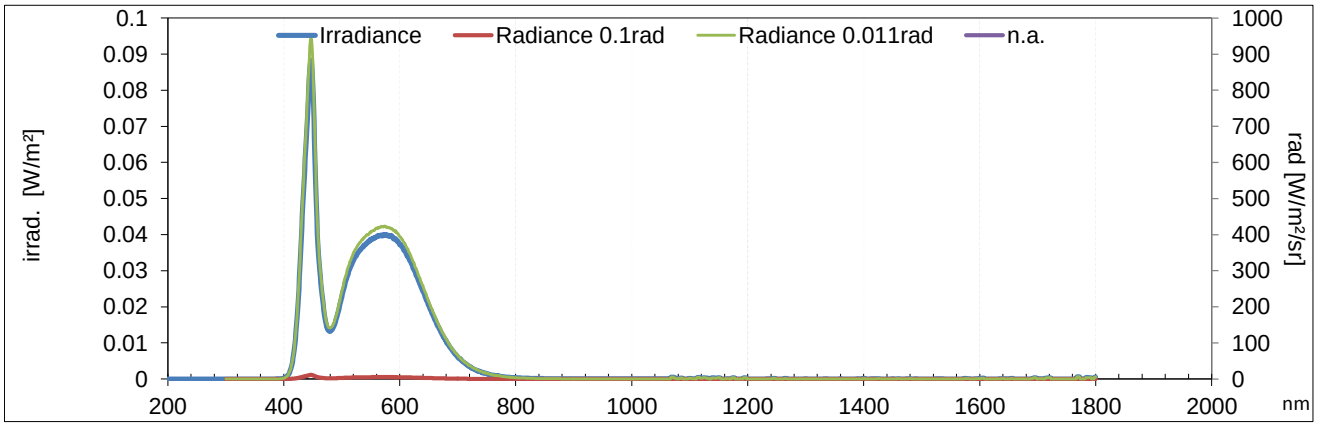
| | | |
|---|---|---|
| U lamp rms | : 3.128 | V |
| I lamp rms | : 1.000 | A |
| P lamp | : 3.129 | W |
| | : | |

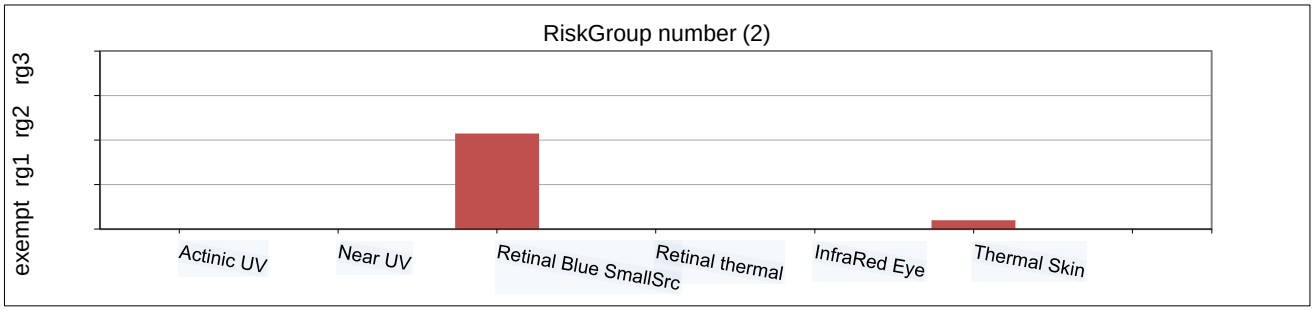
**Calculated photometric quantities (1)**

| | | |
|---|---|---|
| illuminance | : 2553.3 | lx |
| Chromaticity x,y | : 0.322 | 0.311 |
| Colour temperature | : 6108 | K |
| Colour rendition avg8 | : 84 | |

| Hazards at viewing distance | | Emission Level | Emission Limit for Rg2 | Uncertainty Emission Level (k=1) [%] | Emission Level Unit | RiskGroup number (2) | RiskGroup | RG certainty [%] (4) | Emission Hazard Value (3) |
|---|---|---|---|---|---|---|---|---|---|
| Actinic UV | : | 3.0689E-08 | 0.03 | 11 | W/m² | 0 | Exempt | 100 | 0.00 |
| Near UV | : | 0.00078713 | 100 | 4.46 | W/m² | 0 | Exempt | 100 | 0.00 |
| Retinal Blue SmallSrc | : | 2.5143 | 400 | 3.89 | W/m² | 2.15 | RiskGroup 2 | 100 | 0.01 |
| Retinal thermal | : | 323460 | 9466700 | 4.78 | W/m²/sr | 0 | Exempt | 100 | 0.03 |
| InfraRed Eye | : | 0.064835 | 3200 | 7.55 | W/m² | 0 | Exempt | 100 | 0.00 |
| Thermal Skin | : | 8.9256 | 3556.6 | 3.85 | W/m² | 0.2 | pass@10 s | 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

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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 | |
| | | | | Limit | Result | Limit | Result | Limit | Result |
| Actinic UV | SUV(λ) | $E_s$ | W/m² | 1.000E-3 | 30.689E-9 | 0.003 | | 0.03 | |
| Near UV | | $E_{UVA}$ | W/m² | 10.0 | 787.131E-6 | 33 | | 100 | |
| Retinal Blue Light | B(λ) | $L_B$ | W/m²/sr | 100.0 | | 10000 | | 4000000 | |
| Retinal Blue SmallSrc | B(λ) | $E_B$ | W/m² | 1.0* | | 1.0 | | 400 | 2.51428294 |
| Retinal thermal | R(λ) | $L_R$ | W/m²/sr | 3733350.8 | 323459.8 | | | 9466711.04 | |
| InfraRed Eye | | $E_{IR}$ | W/m² | 100.0 | 64.835E-3 | 570 | | 3200 | |
| Thermal Skin | | $E_H$ | W/m² | | 8.9 | | | | |

* 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.

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| Meas type | : PhotoBiological |

# Blue light hazard assessment according to IEC/TR 62778

**Measuring Conditions**

| | | | | |
|---|---|---|---|---|
| | Spectral Range | : | 200-1800 | [nm] |
| | Reporting distance | : | 200 mm (at 2553 lx) | [mm] |
| | Smallest source subtense α | : | 0.0075 | [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 | : | 2553.3 | [lux] |

**Assessment results**

| | | | | |
|---|---|---|---|---|
| | RiskGroup (Retinal blue light) | : | Ethr for Rg2 | |
| $E_{thr}$ | threshold illuminance where source is at riskgroup 2 limit | : | 1015.52 | [lux] |
| $L_B$ | blue light weighted radiance | : | Not applicable | [W/m$^2$/sr] |
| $E_B$ | blue light weighted Irradiance | : | 2.5143 | [W/m$^2$] |
| $K_{B,v}$ | blue light hazard efficacy of luminous radiation | : | 0.0010 | [W/lm] |
| $\eta_B$ | blue light hazard efficiency of radiation | : | 0.2900 | |

**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

The products optimized for visible light emission as device under test use materials known and documented to emit if at all only negligibly in wavelength range 1800nm to 3000nm

The present Irradiance measurement range was therefore limited to 200nm to 1800nm

## 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



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