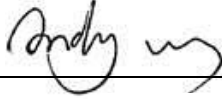
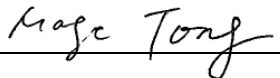




Test Report issued under the responsibility of:



<b>TEST REPORT</b> <b>IEC TR 62778</b> <b>Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires</b>	
Report Number.....	4331224.50
Date of issue .....	2016-08-19
Total number of pages .....	16
Name of Testing Laboratory preparing the Report .....	DEKRA Testing and Certification (Shanghai) Ltd. Guangzhou Branch
Applicant's name .....	Lumileds Commercial (Shanghai) Co., Ltd.
Address.....	No. 9, Lane 888, Tianlin Road, Shanghai, China
<b>Test specification:</b>	
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
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<b>General disclaimer:</b>	
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 CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.	

<b>Test item description</b> ..... :	LED package	
<b>Trade Mark</b> ..... :	LUMILEDS	
<b>Manufacturer</b> .....	Lumileds Commercial (Shanghai) Co., Ltd. No. 9, Lane 888, Tianlin Road, Shanghai, China	
<b>Model/Type reference</b> .....	LUXEON 3030 2D series. Detailed lists refer to Appendix 2: Model List	
<b>Ratings</b> .....	Max 240mA, max 6.6Vdc. Detail information please refer to Appendix 2: Model List	
<b>Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):</b>		
<input checked="" type="checkbox"/>	<b>CB Testing Laboratory:</b>	DEKRA Testing and Certification (Shanghai) Ltd. Guangzhou Branch
<b>Testing location/ address</b> ..... :	Building A3, No. 3 Qiyun Road, Science City, Guangzhou Hi-Tech Industrial Development Zone, Guangzhou, P. R. China	
<b>Tested by (name, function, signature)</b> ..... :	Andy Wang	
<b>Approved by (name, function, signature)</b> ... :	Magic Tong	

<p><b>List of Attachments (including a total number of pages in each attachment):</b></p> <p><b>Appendix 1: Photo Documentation (1 Page)</b></p> <p><b>Appendix 2: Model List (3 Pages)</b></p> <p><b>Appendix 3: Relative Spectrum Of Tested Sample(s) (1 Page)</b></p> <p><b>Appendix 4: Table 6.1BasedOn IEC 62471:2006 (1 Page)</b></p> <p><b>Appendix 5: Table 6.1 Based On EN62471:2008, Attachment To IEC 62471 European Group Differences And National Differences (2 Pages)</b></p>	
<p><b>Summary of testing:</b></p>	
<p><b>Tests performed (name of test and test clause):</b></p> <p>These tests fulfil the requirements of standard ISO/IEC 17025.</p> <p>When determining the test conclusion, the Measurement Uncertainty of test has been considered.</p> <p>The tested sample of L130-4070003000001 from model list at appendix 2 (CCT <math>\leq</math> 4000K) Have been tested</p> <ul style="list-style-type: none"> <li>-according to the IEC 62471(first edition, 2006-07) at 200 mm and been classified as Exempt Group.</li> <li>- according to the EN 62471:2008 at 200 mm and been classified as Risk 1.</li> <li>- according to the IEC/TR62778:2014 and been classified as Risk 1 Unlimited for blue light hazard.</li> </ul>	<p><b>Testing location:</b></p> <p>DEKRA Testing and Certification (Shanghai) Ltd. Guangzhou Branch</p> <p>Building A3, No. 3 Qiyun Road, Science City, Guangzhou Hi-Tech Industrial Development Zone, Guangzhou, P. R. China</p>
<p><b>Summary of compliance with National Differences (List of countries addressed):</b></p> <p><input checked="" type="checkbox"/> The product fulfils the requirements of <u>EN 62471:2008</u> .</p>	
<p><b>Copy of marking plate:</b></p> <p>The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.</p> <p>N/A</p>	

<b>Test item particulars.....:</b>	
<b>Product evaluated.....:</b>	<input checked="" type="checkbox"/> LED package <input type="checkbox"/> LED module <input type="checkbox"/> Lamp <input type="checkbox"/> Luminaire
<b>Rated voltage (V) .....</b>	Max 6,6 Vdc
<b>Rated current (mA) .....</b>	Max 240 mA
<b>Rated CCT (K).....</b>	4000 K
<b>Rated Luminance (Mcd/m<sup>2</sup>) .....</b>	--
<b>Component report data used .....</b>	<input checked="" type="checkbox"/> Not applicable <input type="checkbox"/> LED package <input type="checkbox"/> LED module <input type="checkbox"/> Lamp
<b>Possible test case verdicts:</b>	
- 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)	
<b>Testing.....</b>	--
<b>Date of receipt of test item .....</b>	2016-08-09
<b>Date (s) of performance of tests .....</b>	2016-08-10 to 2016-08-15
<b>General remarks:</b>	
"(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 <input checked="" type="checkbox"/> comma / <input type="checkbox"/> point is used as the decimal separator.	
<b>The product complied with the following standards:</b> <input checked="" type="checkbox"/> IEC 62471:2006 <input checked="" type="checkbox"/> EN 62471:2008 <input type="checkbox"/> IEC/TR 62471-2:2009 <input checked="" type="checkbox"/> IEC/TR 62778:2014	

<b>Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:</b>	
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 .....	<input type="checkbox"/> <b>Yes</b> <input checked="" type="checkbox"/> <b>Not applicable</b>
<b>When differences exist; they shall be identified in the General product information section.</b>	
<b>Name and address of factory (ies) .....</b>	Lumileds Commercial (Shanghai) Co., Ltd. No. 9, Lane 888, Tianlin Road, Shanghai, China
<b>General product information:</b>	
<p>L130-4070003000001, with ANSI bin 4000K, is part of the LUXEON 3030 2D product family. The present classification is thus valid (worst case) for all LUXEON 3030 2D products with part number L130-AABBcccccccc where AA represents nominal ANSI CCT bins can be equal to 4000K or lower, and BB represents CRI ranging can be from 70 to 90 (see TR IEC62778), and cccccccc represents customized code for customer application. See the appendix below for an explanation of the type designation.</p> <p>L130-4070003000001 was subjected to full test at 200 mm.</p> <p>L130-4070003000001 was tested and classified as Exempt Group. Other models were evaluated and classified as Exempt Group. Therefore all these models do not pose any photobiological hazard according to IEC62471. No warning label is required.</p> <p>For the blue light hazard required by IEC TR 62778:2014, model L130-4070003000001 was tested and classified as Risk Group 1. So all these models do not need mark d<sub>thr</sub></p>	

IEC TR 62778			
Clause	Requirement + Test	Result - Remark	Verdict
<b>7</b>	<b>MEASUREMENT INFORMATION FLOW</b>		<b>P</b>
<b>7.1</b>	<b>Basic flow</b>		<b>P</b>
	'Law of conservation of luminance' applied		N/A
	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		N/A
<b>7.2</b>	<b>Conditions for the radiance measurement</b>		<b>P</b>
	Standard condition applied (200mm distance, 0,011rad field of view)		P
	Non-standard condition applied		N/A
<b>7.3</b>	<b>Special cases (I): Replacement by a lamp or LED module of another type</b>		<b>N/A</b>
	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
<b>7.4</b>	<b>Special cases (II): Arrays and clusters of primary light sources</b>		<b>N/A</b>
	LED package is evaluated as .....	<input type="checkbox"/> RG0 unlimited <input type="checkbox"/> RG1 unlimited	N/A
	$E_{thr}$ of LED package applies to array		N/A
<b>8</b>	<b>RISK GROUP CLASSIFICATION</b>		<b>P</b>
	Risk group achieved:		P
	- .. Risk Group 0 unlimited		N/A
	- .. Risk Group 1 unlimited		P
	- $E_{thr}$ ..... (lx) : Distance to reach RG1 ..... (m) :		N/A

TABLE: Spectroradiometric measurement				
Measurement performed on:		<input checked="" type="checkbox"/> LED package <input type="checkbox"/> LED module <input type="checkbox"/> Lamp <input type="checkbox"/> Luminaire		
Model number .....		L130-4070003000001		
Test voltage (V) .....		6,6 Vdc		
Test current (mA) .....		240 mA		
Test frequency (Hz).....		--		
Ambient, t (°C) .....		25°C		
Measurement distance .....		<input checked="" type="checkbox"/> 20 cm <input type="checkbox"/> ... cm		
Source size .....		<input type="checkbox"/> Non-small <input checked="" type="checkbox"/> Small (1,407 x 1,825 mm)		
Field of view .....		<input type="checkbox"/> 100 mrad <input checked="" type="checkbox"/> 11 mrad <input type="checkbox"/> 1,7 mrad (for small sources)		
Item	Symbol	Units	Result	Remark
Correlated colour temperature	CCT	K	3465	
x/y colour coordinates	-	-	0,4102 / 0,3993	
Blue light hazard radiance	L <sub>B</sub>	W/(m <sup>2</sup> •sr <sup>1</sup> )	-	
Blue light hazard irradiance	E <sub>B</sub>	W/m <sup>2</sup>	0,489	
Luminance	L	cd/m <sup>2</sup>	4,87E+06	@11mrad
Illuminance	E	lx	1,13E+03	
Supplementary information:				

TABLE: Angular light distribution		N/A

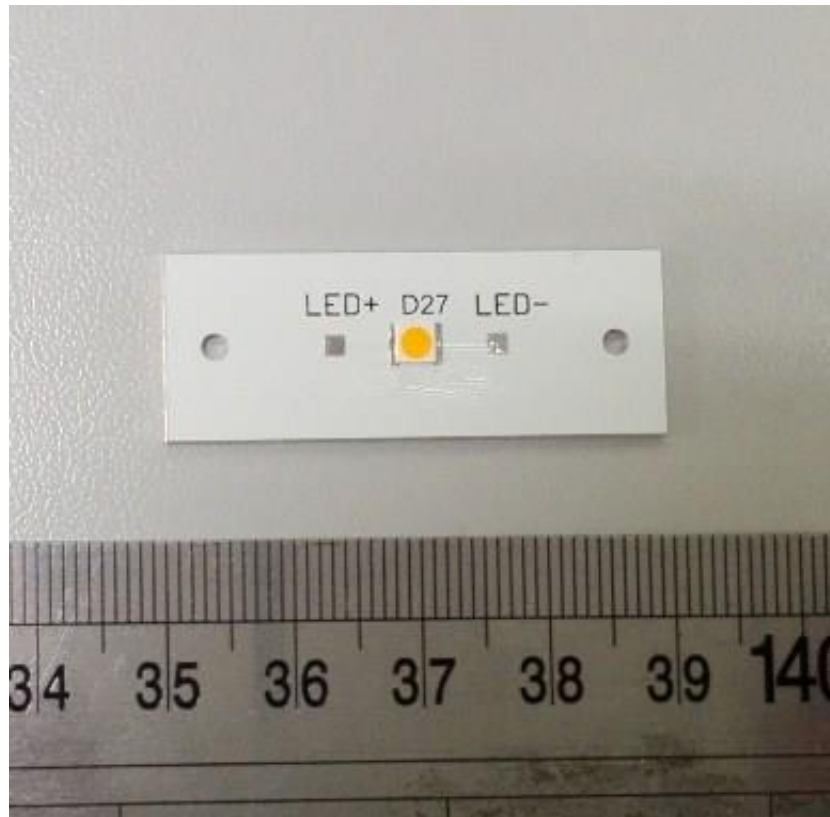
**List of test equipment used:**

A completed list of used test equipment shall be provided in the Test Reports when a Manufacturer Testing Laboratory according to CTF stage 1 or CTF stage 2 procedure has been used.  
 Note: This page may be removed when CTF stage 1 CTF stage 2 are not used. See also clause 4.8 in OD 2020 for more details.

Clause	Measurement / testing	Testing / measuring equipment / material used, (Equipment ID)	Range used	Last Calibration date	Calibration due date
7	Irradiance measurements Radiance measurements	IDR 300 Monochromator (G/L655)	200-3000nm	/	/
7	Radiance measurements	S009 Telescope (G/L655)	300-1400nm	/	/
7	Radiance measurements	SRS 12 Radiance Standard (G/L655)	300-1400nm	2016/1/21	2017/1/20
7	Irradiance measurements	CL6 Spectral irradiance standard (G/L655)	300-3000nm	2016/1/21	2017/1/20
7	Irradiance measurements	CL7 Spectral irradiance standard (G/L655)	200-400nm	2016/1/21	2017/1/20
7	Irradiance measurements	Photometric detector head (G/L655)	380nm-800nm	2016/1/21	2017/1/20
7	Irradiance measurements Radiance measurements	PF2010A Digital power meter (G/L357)	--	2016/4/20	2017/4/19



**Appendix 1: Photo Documentation**



Overview (tested)

**Appendix 2: Model List:**

L130-4070003000001, with ANSI bin 4000K, is part of the LUXEON 3030 2D product family. The present classification is thus valid (worst case) for all LUXEON 3030 2D products with part number L130-AABBcccccccc where AA represents nominal ANSI CCT bins can be equal to 4000K or lower, and BB represents CRI ranging can be from 70 to 90 (see TR IEC62778), and cccccccc represents customized code for customer application. See the appendix below for an explanation of the type designation.

L130-AABBcccccccc

Where

AA designates nominal CCT

BB designates minimum CRI

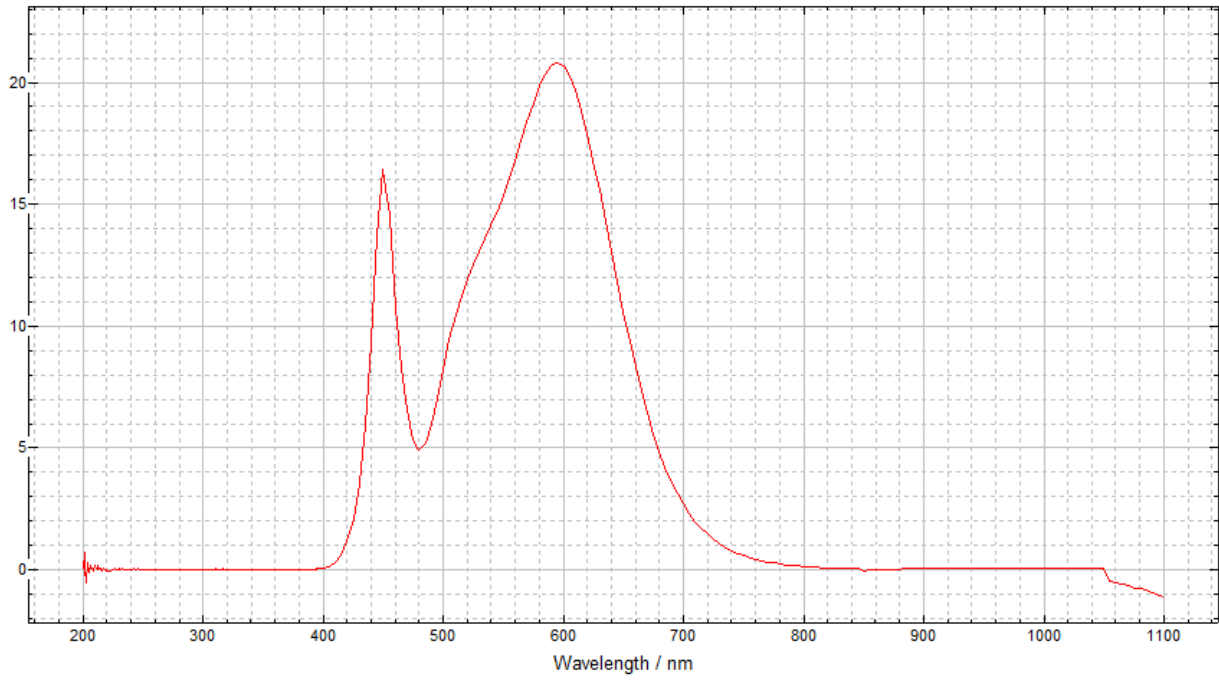
cccccccc customized code for customer application

Part number	CRI	CCT (K)	Max Voltage (V)	Max Current (mA)
L130-2270003000001	70	2200K	6.6	240
L130-2570003000001	70	2500K	6.6	240
L130-2770003000001	70	2700K	6.6	240
L130-3070003000001	70	3000K	6.6	240
L130-3570003000001	70	3500K	6.6	240
L130-4070003000001	70	4000K	6.6	240
L130-2280003000001	80	2200K	6.6	240
L130-2580003000001	80	2500K	6.6	240
L130-2780003000001	80	2700K	6.6	240
L130-3080003000001	80	3000K	6.6	240
L130-3580003000001	80	3500K	6.6	240
L130-4080003000001	80	4000K	6.6	240
L130-2290003000001	90	2200K	6.6	240
L130-2590003000001	90	2500K	6.6	240
L130-2790003000001	90	2700K	6.6	240
L130-3090003000001	90	3000K	6.6	240
L130-3590003000001	90	3500K	6.6	240
L130-4090003000001	90	4000K	6.6	240
L130-2270003000W21	70	2200K	6.6	240
L130-2570003000W21	70	2500K	6.6	240
L130-2770003000W21	70	2700K	6.6	240
L130-3070003000W21	70	3000K	6.6	240
L130-3570003000W21	70	3500K	6.6	240
L130-4070003000W21	70	4000K	6.6	240
L130-2280003000W21	80	2200K	6.6	240
L130-2580003000W21	80	2500K	6.6	240
L130-2780003000W21	80	2700K	6.6	240

L130-3080003000W21	80	3000K	6.6	240
L130-3580003000W21	80	3500K	6.6	240
L130-4080003000W21	80	4000K	6.6	240
L130-2290003000W21	90	2200K	6.6	240
L130-2590003000W21	90	2500K	6.6	240
L130-2790003000W21	90	2700K	6.6	240
L130-3090003000W21	90	3000K	6.6	240
L130-3590003000W21	90	3500K	6.6	240
L130-4090003000W21	90	4000K	6.6	240
L130-2270P23000001	70	2200K	6.6	240
L130-2570P23000001	70	2500K	6.6	240
L130-2770P23000001	70	2700K	6.6	240
L130-3070P23000001	70	3000K	6.6	240
L130-3570P23000001	70	3500K	6.6	240
L130-4070P23000001	70	4000K	6.6	240
L130-2280P23000001	80	2200K	6.6	240
L130-2580P23000001	80	2500K	6.6	240
L130-2780P23000001	80	2700K	6.6	240
L130-3080P23000001	80	3000K	6.6	240
L130-3580P23000001	80	3500K	6.6	240
L130-4080P23000001	80	4000K	6.6	240
L130-2290P23000001	90	2200K	6.6	240
L130-2590P23000001	90	2500K	6.6	240
L130-2790P23000001	90	2700K	6.6	240
L130-3090P23000001	90	3000K	6.6	240
L130-3590P23000001	90	3500K	6.6	240
L130-4090P23000001	90	4000K	6.6	240
L130-2270NB3000001	70	2200k	6.6	240
L130-2570NB3000001	70	2500K	6.6	240
L130-2770NB3000001	70	2700K	6.6	240
L130-3070NB3000001	70	3000K	6.6	240
L130-3570NB3000001	70	3500K	6.6	240
L130-4070NB3000001	70	4000K	6.6	240
L130-2280NB3000001	80	2200k	6.6	240
L130-2580NB3000001	80	2500K	6.6	240
L130-2780NB3000001	80	2700K	6.6	240
L130-3080NB3000001	80	3000K	6.6	240
L130-3580NB3000001	80	3500K	6.6	240
L130-4080NB3000001	80	4000K	6.6	240
L130-2290NB3000001	90	2200k	6.6	240
L130-2590NB3000001	90	2500K	6.6	240

L130-2790NB3000001	90	2700K	6.6	240
L130-3090NB3000001	90	3000K	6.6	240
L130-3590NB3000001	90	3500K	6.6	240
L130-4090NB3000001	90	4000K	6.6	240
L130-2270NB3000W21	70	2200k	6.6	240
L130-2570NB3000W21	70	2500K	6.6	240
L130-2770NB3000W21	70	2700K	6.6	240
L130-3070NB3000W21	70	3000K	6.6	240
L130-3570NB3000W21	70	3500K	6.6	240
L130-4070NB3000W21	70	4000K	6.6	240
L130-2280NB3000W21	80	2200k	6.6	240
L130-2580NB3000W21	80	2500K	6.6	240
L130-2780NB3000W21	80	2700K	6.6	240
L130-3080NB3000W21	80	3000K	6.6	240
L130-3580NB3000W21	80	3500K	6.6	240
L130-4080NB3000W21	80	4000K	6.6	240
L130-2290NB3000W21	90	2200k	6.6	240
L130-2590NB3000W21	90	2500K	6.6	240
L130-2790NB3000W21	90	2700K	6.6	240
L130-3090NB3000W21	90	3000K	6.6	240
L130-3590NB3000W21	90	3500K	6.6	240
L130-4090NB3000W21	90	4000K	6.6	240

**Appendix 3: Relative Spectrum Of Tested Sample(s)**



**Appendix 4: Table 6.1 Based On IEC 62471:2006**

DUT: L130-4070003000001, Evaluation Distance: 200mm, Angular subtense of the apparent source  $\alpha$ : 8,1mrad

Table 6.1 Emission limits for risk groups of continuous wave lamps									P
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	0,00037	0,003	--	0,03	--
Near UV		$E_{UVA}$	$W \cdot m^{-2}$	10	0,00063	33	--	100	--
Blue light	$B(\lambda)$	$L_B$	$W \cdot m^{-2} \cdot sr^{-1}$	100	--	10000	--	4000000	--
Blue light, small source	$B(\lambda)$	$E_B$	$W \cdot m^{-2}$	1,0*	0,49	1,0	--	400	--
Retinal thermal	$R(\lambda)$	$L_R$	$W \cdot m^{-2} \cdot sr^{-1}$	$28000/\alpha$	37575,63	$28000/\alpha$	--	$71000/\alpha$	--
Retinal thermal, weak visual stimulus**	$R(\lambda)$	$L_{IR}$	$W \cdot m^{-2} \cdot sr^{-1}$	$6000/\alpha$	--	$6000/\alpha$	--	$6000/\alpha$	--
IR radiation, eye		$E_{IR}$	$W \cdot m^{-2}$	100	0,01	570	--	3200	--

\* 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

**Appendix 5: Table 6.1 Based On EN62471:2008, Attachment To IEC 62471 European Group Differences And National Differences**

DUT: L130-4070003000001, Evaluation Distance: 200mm, Angular subtense of the apparent source  $\alpha$ : 8,1mrad

<b>Table 6.1</b>		Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC)							P	
Risk	Action spectrum	Symbol	Units	Emission Measurement L130-4070003000001, $\alpha=8,1$ mrad						
				Exempt		Low risk		Mod risk		
				Limit	Result	Limit	Result	Limit	Result	
Actinic UV	$S_{UV}(\lambda)$	$E_s$	$W \cdot m^{-2}$	0,001	0,00037	-	-	-	-	
Near UV		$E_{UVA}$	$W \cdot m^{-2}$	0,33	0,00063	-	-	-	-	
Blue light	$B(\lambda)$	$L_B$	$W \cdot m^{-2} \cdot sr^{-1}$	100	--	10000	--	4000000	--	
Blue light, small source	$B(\lambda)$	$E_B$	$W \cdot m^{-2}$	0,01*	--	1,0	0,49	400	--	
Retinal thermal	$R(\lambda)$	$L_R$	$W \cdot m^{-2} \cdot sr^{-1}$	$28000/\alpha$	37575,63	$28000/\alpha$	--	$71000/\alpha$	--	
Retinal thermal, weak visual stimulus**	$R(\lambda)$	$L_{IR}$	$W \cdot m^{-2} \cdot sr^{-1}$	545000	--					
				$0,0017 \leq \alpha \leq 0,011$						
IR radiation, eye		$E_{IR}$	$W \cdot m^{-2}$	6000/ $\alpha$	--					
				$0,011 \leq \alpha \leq 0,1$						
				100	0,01	570	--	3200	--	

<b>Table 6.1</b>	Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC)	P
<p>* Small source defined as one with <math>\alpha &lt; 0,011</math> radian. Averaging field of view at 10000 s is 0,1 radian.</p> <p>** Involves evaluation of non-GLS source</p> <p>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.</p>		

-END-