





<p>TEST REPORT IEC TR 62778 Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires</p>	
Report Number.....	3198734.50P
Date of issue	2016-11-11
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Name of Testing Laboratory preparing the Report	DEKRA Testing and Certification (Shanghai) Ltd. 3/F, #250, Jiangchangsan Road building 16 Headquater Economy Park Shibe Hi-Tech Park, Zhabei District, Shanghai, P.R.C 200436
Applicant's name	Philips Lighting (China) Investment Co., Ltd.
Address.....	Building 9, Lane 888, Tianlin Road, Minhang district, Shanghai
Test specification:	
Standard	IEC TR 62778:2014 (Second Edition)
Test procedure	Type Test
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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Test item description	LED chip	
Trade Mark	PHILIPS	
Manufacturer	Philips Lighting (China) Investment Co., Ltd. Building 9, Lane 888, Tianlin Road, Minhang district, Shanghai	
Model/Type reference	CertaFlux SLM C 927 1201 L06 G1 CertaFlux SLM C 850 1208 L14 G1	
Ratings	CertaFlux SLM C 927 1201 L06 G1: 250mA, 41Vdc CertaFlux SLM C 850 1208 L14 G1: 1600mA, 40Vdc	
Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
<input checked="" type="checkbox"/>	CB Testing Laboratory:	DEKRA Testing and Certification (Shanghai) Ltd.
	Testing location/ address	3/F, #250, Jiangchangsan Road building 16 Headquater Economy Park Shibe Hi-Tech Park, Zhabei District, Shanghai, P.R.C 200436
<input type="checkbox"/>	Associated CB Testing Laboratory:	
	Testing location/ address	
	Tested by (name, function, signature)	Yuelie Wu 
	Approved by (name, function, signature) ...:	Hanson Zhang 
<input type="checkbox"/>	Testing procedure: CTF Stage 1:	
	Testing location/ address	
	Tested by (name, function, signature)	
	Approved by (name, function, signature)	
<input type="checkbox"/>	Testing procedure: CTF Stage 2:	
	Testing location/ address	
	Tested by (name + signature)	
	Witnessed by (name, function, signature)	
	Approved by (name, function, signature)	
<input type="checkbox"/>	Testing procedure: CTF Stage 3:	
<input type="checkbox"/>	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)		

<p>List of Attachments (including a total number of pages in each attachment):</p> <ul style="list-style-type: none"> ● Appendix 1: Photo Documentation ● Appendix 2: Model List ● Appendix 3: Relative Spectrum Of Tested Sample(s) ● Appendix 4: Table 6.1 Based On IEC 62471:2006 ● Appendix 5: Table 6.1 Based On EN62471:2008, Attachment To IEC 62471 European Group Differences And National Differences 	
<p>Summary of testing:</p>	
<p>Tests performed (name of test and test clause):</p> <p>These tests fulfil the requirements of standard ISO/IEC 17025. When determining the test conclusion, the Measurement Uncertainty of test has been considered.</p> <p>The tested sample of CertaFlux SLM C 927 1201 L06 G1 Have been tested according to the IEC 62471 (first edition, 2006-07) at 200mm and been classified as RG 1. Have been tested according to the EN 62471:2008 at 200mm and been classified as RG 1. Have been tested according to the IEC/TR 62778:2014 and been classified as RG 1 Unlimited for blue light hazard.</p> <p>CertaFlux SLM C 850 1208 L14 G1 Have been tested according to the IEC 62471 (first edition, 2006-07) at 200mm and been classified as RG 2. Have been tested according to the EN 62471:2008 at 200mm and been classified as RG 2. Have been tested according to the IEC/TR 62778:2014 and been classified as RG 2 for blue light hazard.</p>	<p>Testing location:</p> <p>DEKRA Testing and Certification (Shanghai) Ltd. 3/F, #250, Jiangchangsan Road building 16 Headquater Economy Park Shibe Hi-Tech Park, Zhabei District, Shanghai, P.R.C 200436</p>
<p>Summary of compliance with National Differences (List of countries addressed): EN Standards</p> <p>EN 62471:2008</p> <p><input checked="" type="checkbox"/> The product fulfills the requirements</p>	

Copy of marking plate:

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.

N/A

Test item particulars.....: See below	
Product evaluated.....:	<input checked="" type="checkbox"/> LED package <input type="checkbox"/> LED module <input type="checkbox"/> Lamp <input type="checkbox"/> Luminaire
Rated voltage (V)	40Vdc, 41Vdc
Rated current (mA)	250mA, 1600mA
Rated CCT (K).....:	--
Rated Luminance (Mcd/m²)	--
Component report data used	<input checked="" type="checkbox"/> Not applicable <input type="checkbox"/> LED package <input type="checkbox"/> LED module <input type="checkbox"/> Lamp Report number: --
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	2016-11-10
Date (s) of performance of tests	2016-11-10to 2016-11-11
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 <input checked="" type="checkbox"/> comma / <input type="checkbox"/> point is used as the decimal separator.	
The product complied with the following standards:	
<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	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 60730-1:	
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"/> Yes <input checked="" type="checkbox"/> Not applicable

When differences exist; they shall be identified in the General product information section.

Name and address of factory (ies) : Philips Lighting (China) Investment Co., Ltd.
Building 9, Lane 888, Tianlin Road, Minhang
district, Shanghai

General product information:

Full tests were performed on model CertaFlux SLM C 927 1201 L06 G1, CertaFlux SLM C 850 1208 L14 G1

The products considered as worst case which should be evaluated at 200mm.

The sample of CertaFlux SLM C 927 1201 L06 G1 was tested at 200mm from the light source. CCT of spectral irradiance was found at 2859 K.

The sample of CertaFlux SLM C 850 1208 L14 G1 was tested at 200mm from the light source. CCT of spectral irradiance was found at 5038 K.

Type test was performed according to IEC 62471:2006 procedure.

IEC TR 62778			
Clause	Requirement + Test	Result - Remark	Verdict
7	MEASUREMENT INFORMATION FLOW		P
7.1	Basic flow		P
	'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
7.2	Conditions for the radiance measurement		P
	Standard condition applied (200mm distance, 0,011rad field of view)		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 : <input type="checkbox"/> RG0 unlimited <input type="checkbox"/> RG1 unlimited		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	For CertaFlux SLM C 927 1201 L06 G1	P
	- E_{thr} (lx) : Distance to reach RG1 (m) :	For CertaFlux SLM C 850 1208 L14 G1 Refer to the Supplementary information of TABLE: Spectroradiometric measurement as following	P

IEC TR 62778			
Clause	Requirement + Test	Result - Remark	Verdict

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	CertaFlux SLM C 927 1201 L06 G1		
	Test voltage (V)	41Vdc		
	Test current (mA)	250mA		
	Test frequency (Hz)	--		
	Ambient, t(°C)	25°C		
	Measurement distance	<input checked="" type="checkbox"/> 20 cm <input type="checkbox"/> ... cm		
	Source size	<input checked="" type="checkbox"/> Non-small <input type="checkbox"/> Small :		
	Field of view	<input type="checkbox"/> 100 mrad <input checked="" type="checkbox"/> 11 mrad <input type="checkbox"/> 1,7 mrad (for small sources)		
Item	Symb ol	Units	Result	Remark
Correlated colour temperature	CCT	K	2859	
x/y colour coordinates			0,4528/0,4180	
Blue light hazard radiance	L _B	W/(m ² •sr ¹)	6,63E+03	@11mrad
Blue light hazard irradiance	E _B	W/m ²	--	
Luminance	L	cd/m ²	2,13E+07	@11mrad
Illuminance	E	lx	8,01E+03	
Supplementary information: N/A				

IEC TR 62778			
Clause	Requirement + Test	Result - Remark	Verdict

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.....	CertaFlux SLM C 850 1208 L14 G1		
	Test voltage (V)	40Vdc		—
	Test current (mA)	1600mA		—
	Test frequency (Hz).....	--		—
	Ambient, t(°C)	25°C		—
	Measurement distance	<input checked="" type="checkbox"/> 20 cm <input type="checkbox"/> ... cm		—
	Source size	<input checked="" type="checkbox"/> Non-small <input type="checkbox"/> Small :		—
	Field of view	<input type="checkbox"/> 100 mrad <input checked="" type="checkbox"/> 11 mrad <input type="checkbox"/> 1,7 mrad (for small sources)		—
Item	Symb ol	Units	Result	Remark
Correlated colour temperature	CCT	K	5038	
x/y colour coordinates			0,3453/0,3650	
Blue light hazard radiance	L _B	W/(m ² •sr ¹)	1,65E+04	@11mrad
Blue light hazard irradiance	E _B	W/m ²	--	
Luminance	L	cd/m ²	2,28E+07	@11mrad
Illuminance	E	lx	6,41E+04	
Supplementary information: Per IEC/TR 62778:2014 E _{thr} = 1384 lx D _{min} = 1361 mm				
When the test current is 820 mA, the blue light hazard radiance can be reduced to 9,93E+03 W/(m ² •sr ¹), and the sample can be classified as RG 1 Unlimited for blue light hazard .				

IEC TR 62778			
Clause	Requirement + Test	Result - Remark	Verdict

	TABLE: Angular light distribution	N/A

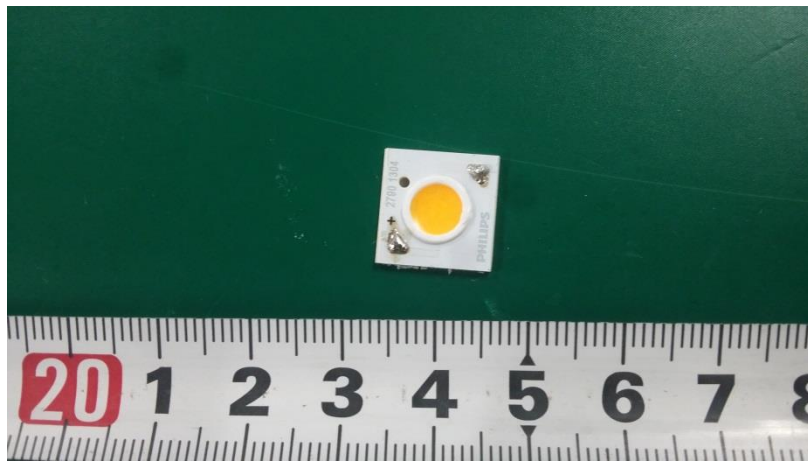
List of test equipment used:

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.

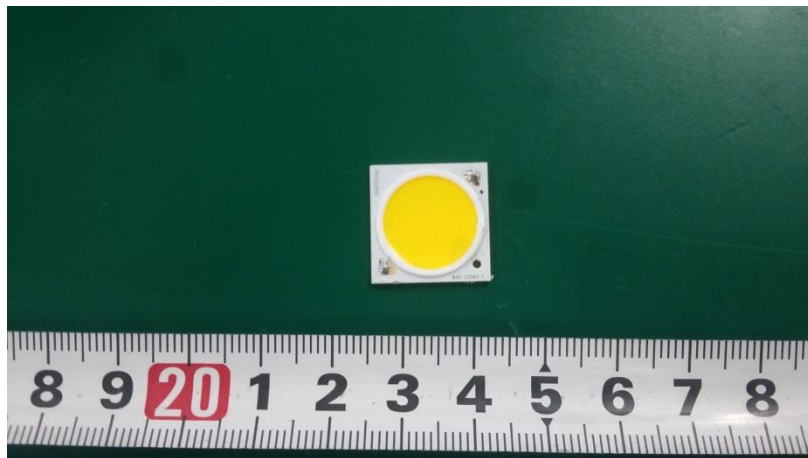
Note: This page may be removed when CTF stage 1 CTF stage 2 are not used. See also clause 4.8 in OD 2020 for more details.

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 (SH 344)	200-3000nm	/	/
7	Radiance measurements	S009 Telescope (SH 345)	300-1400nm	/	/
7	Radiance measurements	SRS 12 Radiance Standard (SH 348)	300-1400nm	2016/3/22	2017/3/22
7	Irradiance measurements	CL6 Spectral irradiance standard (SH 350)	300-3000nm	2016/3/22	2017/3/22
7	Irradiance measurements	CL7 Spectral irradiance standard (SH 351)	200-400nm	2016/3/22	2017/3/22
7	Irradiance measurements	Photometric detector head (SH 359)	380nm-800nm	2016/3/22	2017/3/22
7	Irradiance measurements Radiance measurements	Wattmeter (SH070)	500V,40A	2016/10/13	2017/10/13

Appendix 1: Photo Documentation



CertaFlux SLM C 927 1201 L06 G1



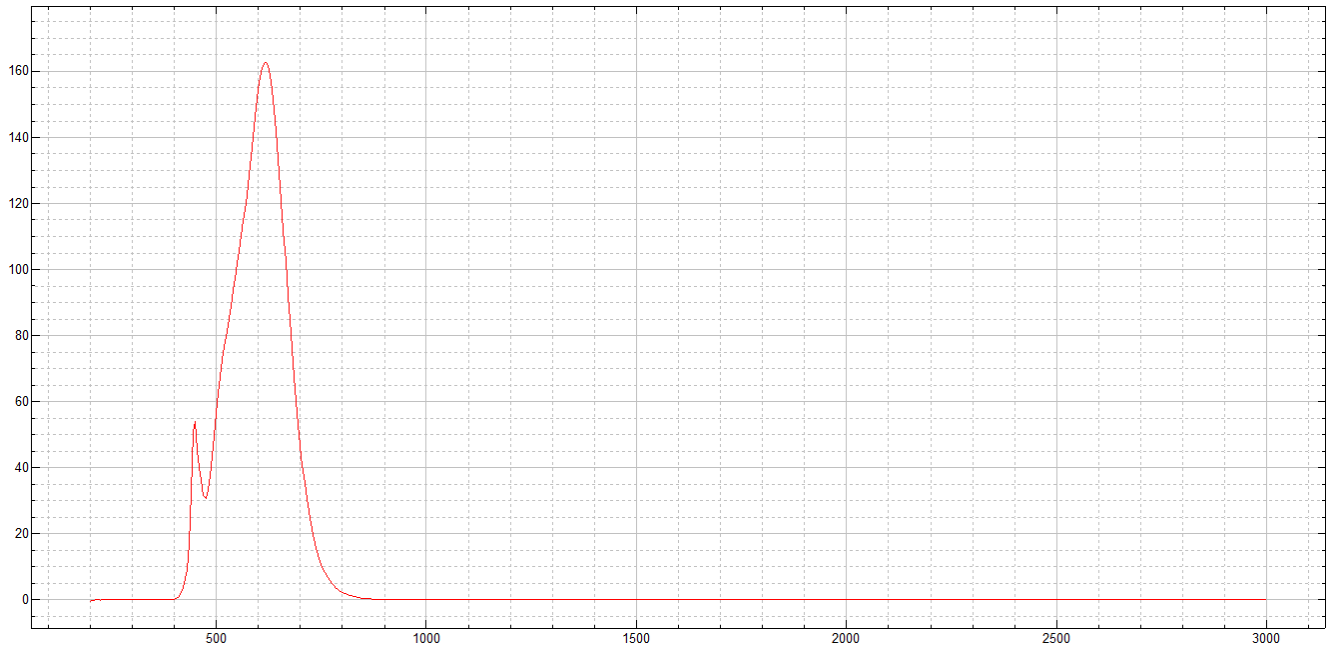
CertaFlux SLM C 850 1208 L14 G1

Overview

Appendix 2: Model List

N/A

Appendix 3: Relative Spectrum Of Tested Sample(s)



CertaFlux SLM C 850 1208 L14 G1



CertaFlux SLM C 927 1201 L06 G1

Appendix 4: Table 6.1 Based On IEC 62471:2006

DUT: CertaFlux SLM C 927 1201 L06 G1, Evaluation Distance: 200mm, Angular subtense of the apparent source α : 30 mrad

IEC 62471									
Clause	Requirement + Test				Result – Remark				Verdict
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	0,0000	0,003		0,03	
Near UV		E_{UVA}	$W \cdot m^{-2}$	10	0,0000	33		100	
Blue light	$B(\lambda)$	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	2,47E+02	10000	6,63E+03	4000000	
Blue light, small source	$B(\lambda)$	E_B	$W \cdot m^{-2}$	1,0*	--	1,0		400	
Retinal thermal	$R(\lambda)$	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/ α	1,22E+05	28000/ α		71000/ α	
Retinal thermal, weak visual stimulus**	$R(\lambda)$	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	6000/ α	--	6000/ α		6000/ α	
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	0,13	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 4: Table 6.1 Based On IEC 62471:2006

DUT: CertaFlux SLM C 850 1208 L14 G1, Evaluation Distance: 200mm, Angular subtense of the apparent source α : 70 mrad

IEC 62471									
Clause	Requirement + Test				Result – Remark				Verdict
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	0,0000	0,003		0,03	
Near UV		E_{UVA}	$W \cdot m^{-2}$	10	0,0000	33		100	
Blue light	$B(\lambda)$	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	5,18E+03	10000	1,65E+04	4000000	3,63E+04
Blue light, small source	$B(\lambda)$	E_B	$W \cdot m^{-2}$	1,0*	--	1,0		400	
Retinal thermal	$R(\lambda)$	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/ α	4,22E+05	28000/ α		71000/ α	
Retinal thermal, weak visual stimulus**	$R(\lambda)$	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	6000/ α	--	6000/ α		6000/ α	
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	0,32	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: CertaFlux SLM C 927 1201 L06 G1, Evaluation Distance: 200mm, Angular subtense of the apparent source α : 30 mrad

EN 62471										
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	
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	0,0000	--	--	--	--	
Near UV		E_{UVA}	$W \cdot m^{-2}$	0,33	0,0000	--	--	--	--	
Blue light	$B(\lambda)$	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	2,47E+02	10000	6,63E+03	4000000		
Blue light, small source	$B(\lambda)$	E_B	$W \cdot m^{-2}$	0,01*	--	1,0		400		
Retinal thermal	$R(\lambda)$	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/ α	1,22E+05	28000/ α		71000/ α		
Retinal thermal, weak visual stimulus**	$R(\lambda)$	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	545000 0,0017 ≤ α ≤ 0,011	--					
				6000/ α 0,011 ≤ α ≤ 0,1	--					
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	0,13	570		3200		
<p>* Small source defined as one with $\alpha < 0,011$ 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>										

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

DUT: CertaFlux SLM C 850 1208 L14 G1, Evaluation Distance: 200mm, Angular subtense of the apparent source α : 70 mrad

EN 62471										
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	
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	0,0000	--	--	--	--	
Near UV		E_{UVA}	$W \cdot m^{-2}$	0,33	0,0000	--	--	--	--	
Blue light	$B(\lambda)$	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	5,18E+03	10000	1,65E+04	4000000	3,63E+04	
Blue light, small source	$B(\lambda)$	E_B	$W \cdot m^{-2}$	0,01*	--	1,0		400		
Retinal thermal	$R(\lambda)$	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/ α	4,22E+05	28000/ α		71000/ α		
Retinal thermal, weak visual stimulus**	$R(\lambda)$	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	545000 0,0017 $\leq \alpha \leq$ 0,011	--					
				6000/ α 0,011 $\leq \alpha \leq$ 0,1	--					
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	0,32	570		3200		
<p>* Small source defined as one with $\alpha < 0,011$ 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>										