

Test Report issued under the responsibility of:



TEST REPORT IEC TR 62778 Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires	
Report Number.....:	6108075.50P
Date of issue.....:	2021-08-12
Total number of pages	32
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, Jing'an District, Shanghai, P.R.C 200436
Applicant's name.....:	Lumileds (Shanghai) Management Co.,Ltd.
Address	Building 1-A, No.19 & 20, Lane 299, Wenshui Road, JingAn District, Shanghai, P.R. China, 200072
Test specification:	
Standard	EN 62471: 2008 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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Test item description	LED module	
Trade Mark	LUMILEDS	
Manufacturer	Lumileds (Shanghai) Management Co.,Ltd. Building 1-A, No.19 & 20, Lane 299, Wenshui Road, JingAn District, Shanghai, P.R. China, 200072	
Model/Type reference	L170-aabb70ccddddd, where aa = nominal CCT (22=2200K,27=2700K,30 =3000K,35=3500K,40 = 4000K, 50=5000K,57=5700K,65=6500K) bb = min CRI (70 = 70CRI,80=80CRI,90=90 CRI), cc=froward voltage(12 = 12V, 18=18V,24=24V,36 = 36V, 72=72V) , ddddd for marketing use	
Ratings	Max current 1200mA	
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 Shibei Hi-Tech Park, Jing'an District, Shanghai, P.R.C 200436
<input type="checkbox"/>	Associated CB Testing Laboratory:	
Testing location/ address		
Tested by (name, function, signature)		Nancy Wang <i>Nancy Wang</i>
Approved by (name, function, signature)		Hanson Zhang <i>Hanson</i>
<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 L170-3070701200000 (1100mA) L170-4070701200000 (650mA) L170-6570701200000 (330mA) 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>The tested sample of L170-3070701200000 (1200mA) L170-4070701200000 (1200mA) L170-6570701200000 (1200mA) 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, Jing'an District, Shanghai, P.R.C 200436</p>

Summary of compliance with National Differences (List of countries addressed): EN Standards

EN 62471:2008

The product fulfills the requirements

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 type="checkbox"/> LED package <input checked="" type="checkbox"/> LED module <input type="checkbox"/> Lamp <input type="checkbox"/> Luminaire	
Rated voltage (V): --	
Rated current (mA): Max current 1200 mA	
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 : 2021-06-21	
Date (s) of performance of tests : 2021-08-12	
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 Decision rules applied Procedure 2 "Accuracy Method" as stated in the IEC Guide 115:2007.	
Manufacturer's Declaration per sub-clause 4.2.5 of IEC 62471-2:	
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)..... : Lumileds (Shanghai) Management Co.,Ltd.
Building 1-A, No.19 & 20, Lane 299, Wenshui
Road, JingAn District, Shanghai, P.R. China,
200072

General product information:

Full tests were performed on model L170-3070701200000, L170-4070701200000 and L170-6570701200000.

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

The sample of L170-3070701200000, L170-4070701200000 and L170-6570701200000 was tested at 200mm from the light source.

Base on the Model list which listed on the appendix 2, The tested sample can be considered as

typical product worst product

Which the results can be reference used for the other models.

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	L170-3070701200000 (1100mA); L170-4070701200000 (650mA); L170-6570701200000 (330mA)	P
	- E_{thr} (lx) : Distance to reach RG1 (m) :	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 type="checkbox"/> LED package <input checked="" type="checkbox"/> LED module <input type="checkbox"/> Lamp <input type="checkbox"/> Luminaire		
	Model number	L170-3070701200000		
	Test voltage (V)	--		—
	Test current (mA)	1200 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 :		—
	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	3101	
x/y colour coordinates			0,4291/0,3998	
Blue light hazard radiance	L _B	W/(m ² ·sr ¹)	1,06E+04	@11mrad
Blue light hazard irradiance	E _B	W/m ²	--	
Luminance	L	cd/m ²	2,46E+07	@11mrad
Illuminance	E	lx	1,05E+04	
Supplementary information: Per IEC/TR 62778:2014 E _{thr} = 2310 lx D _{min} = 426 mm				

IEC TR 62778			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE: Spectroradiometric measurement				
	Measurement performed on:	<input type="checkbox"/> LED package <input checked="" type="checkbox"/> LED module <input type="checkbox"/> Lamp <input type="checkbox"/> Luminaire		
	Model number	L170-3070701200000		
	Test voltage (V)	--		—
	Test current (mA)	1100 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 :		—
	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	3093	
x/y colour coordinates			0,4293/0,3993	
Blue light hazard radiance	L _B	W/(m ² ·sr ¹)	9,96E+03	@11mrad
Blue light hazard irradiance	E _B	W/m ²	--	
Luminance	L	cd/m ²	2,70E+07	@11mrad
Illuminance	E	lx	1,05E+04	
Supplementary information: N/A				

IEC TR 62778				
Clause	Requirement + Test		Result - Remark	Verdict
	TABLE: Spectroradiometric measurement			
	Measurement performed on:	<input type="checkbox"/> LED package <input checked="" type="checkbox"/> LED module <input type="checkbox"/> Lamp <input type="checkbox"/> Luminaire		
	Model number	L170-4070701200000		
	Test voltage (V)	--		—
	Test current (mA)	1200 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 :		—
	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	3994	
x/y colour coordinates			0,3831/0,3856	
Blue light hazard radiance	L _B	W/(m ² ·sr ¹)	1,64E+04	@11mrad
Blue light hazard irradiance	E _B	W/m ²	--	
Luminance	L	cd/m ²	3,00E+07	@11mrad
Illuminance	E	lx	1,03E+04	
Supplementary information: Per IEC/TR 62778:2014 E _{thr} = 1828 lx D _{min} = 476 mm				

IEC TR 62778			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE: Spectroradiometric measurement				
	Measurement performed on:	<input type="checkbox"/> LED package <input checked="" type="checkbox"/> LED module <input type="checkbox"/> Lamp <input type="checkbox"/> Luminaire		
	Model number	L170-4070701200000		
	Test voltage (V)	--		—
	Test current (mA)	650 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 :		—
	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	4003	
x/y colour coordinates			0,3833/0,3876	
Blue light hazard radiance	L _B	W/(m ² ·sr ¹)	9,92E+03	@11mrad
Blue light hazard irradiance	E _B	W/m ²	--	
Luminance	L	cd/m ²	1,93E+07	@11mrad
Illuminance	E	lx	7,69E+03	
Supplementary information: N/A				

IEC TR 62778				
Clause	Requirement + Test		Result - Remark	Verdict
	TABLE: Spectroradiometric measurement			
	Measurement performed on:	<input type="checkbox"/> LED package <input checked="" type="checkbox"/> LED module <input type="checkbox"/> Lamp <input type="checkbox"/> Luminaire		
	Model number	L170-6570701200000		
	Test voltage (V)	--		—
	Test current (mA)	1200 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 :		—
	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	6949	
x/y colour coordinates			0,3060/0,3227	
Blue light hazard radiance	L _B	W/(m ² ·sr ¹)	2,98E+04	@11mrad
Blue light hazard irradiance	E _B	W/m ²	--	
Luminance	L	cd/m ²	2,50E+07	@11mrad
Illuminance	E	lx	9,67E+03	
Supplementary information: Per IEC/TR 62778:2014 E _{thr} = 839 lx D _{min} = 679 mm				

IEC TR 62778				
Clause	Requirement + Test		Result - Remark	Verdict
	TABLE: Spectroradiometric measurement			
	Measurement performed on:	<input type="checkbox"/> LED package <input checked="" type="checkbox"/> LED module <input type="checkbox"/> Lamp <input type="checkbox"/> Luminaire		
	Model number	L170-6570701200000		
	Test voltage (V)	--		—
	Test current (mA)	330 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 :		—
	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	6787	
x/y colour coordinates			0,3077/0,3286	
Blue light hazard radiance	L _B	W/(m ² ·sr ¹)	9,90E+03	@11mrad
Blue light hazard irradiance	E _B	W/m ²	--	
Luminance	L	cd/m ²	9,15E+06	@11mrad
Illuminance	E	lx	3,81E+03	
Supplementary information: N/A				

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.

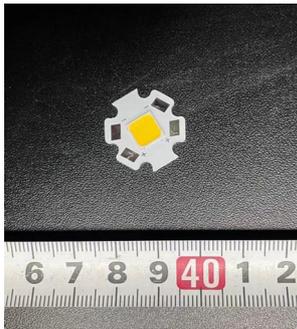
Note: This page may be removed when CTF stage 1 CTF stage 2 are not used. See also clause 4.8 in OD 2020 for more details.

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	2021/2/25	2022/2/24
7	Irradiance measurements	CL6 Spectral irradiance standard (SH 350)	300-3000nm	2021/2/25	2022/2/24
7	Irradiance measurements	CL7 Spectral irradiance standard (SH 351)	200-400nm	2021/2/25	2022/2/24
7	Irradiance measurements	Photometric detector head (SH 359)	380nm-800nm	2021/2/26	2022/2/25
7	Irradiance measurements Radiance measurements	Wattmeter (SH030)	500V,40A	2020/10/10	2021/10/10

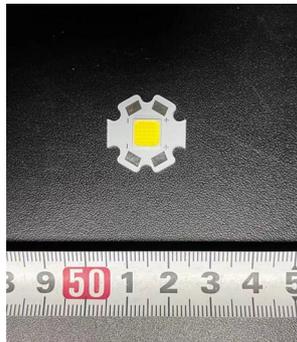
Appendix 1: Photo Documentation



L170-3070701200000



L170-4070701200000



L170-6570701200000

Appendix 2: Model List

L170-aabb70ccddddd

where

aa = nominal CCT (22=2200K,27=2700K,30 =3000K,35=3500K,40 = 4000K, 50=5000K,57=5700K,65=6500K);

bb = min CRI (70 = 70CRI,80=80CRI,90=90 CRI);

cc=froward voltage(12 = 12V, 18=18V,24=24V,36 = 36V, 72=72V);

ddddd for marketing use.

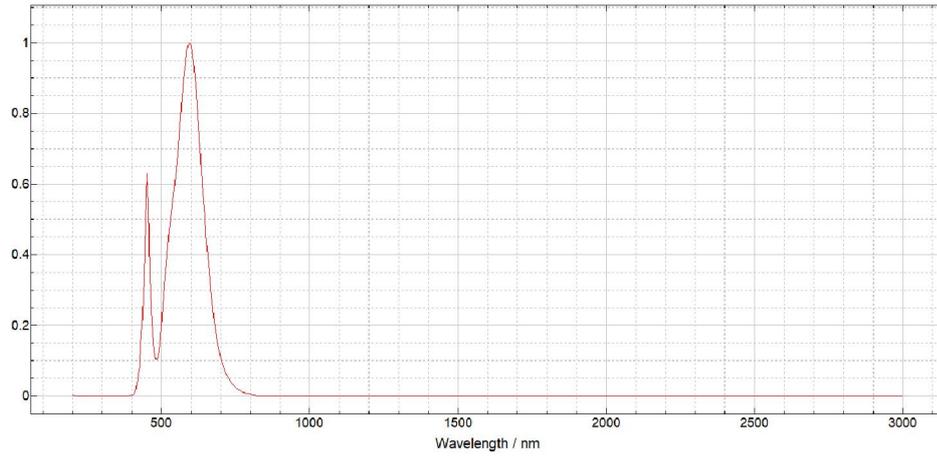
Model	Max Current (mA)
L170-aabb7012ddddd	1200
L170-aabb7018ddddd	800
L170-aabb7024ddddd	600
L170-aabb7036ddddd	400
L170-aabb7072ddddd	200

Threshold drive current for RG1-RG2 boundary limit:

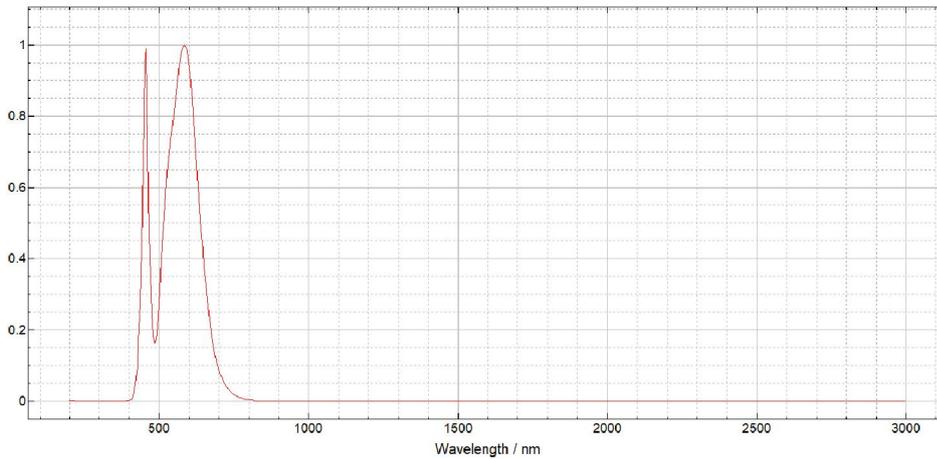
	Threshold drive current (mA)	Nominal CCT		
		≤3000K	≤4000K	≤6500K
L170-aabb7012ddddd	1200	RG2	RG2	RG2
	1100	RG1 unlimited	RG2	RG2
	650	RG1 unlimited	RG1 unlimited	RG2
	330	RG1 unlimited	RG1 unlimited	RG1 unlimited

Eth _r (lx)	Threshold drive current (mA)	Nominal CCT		
		≤3000K	≤4000K	≤6500K
L170-aabb7012ddddd	1200	2310 lx	1828 lx	839 lx
	1100	n/a	1828 lx	839 lx
	650	n/a	n/a	839lx
	330	n/a	n/a	n/a

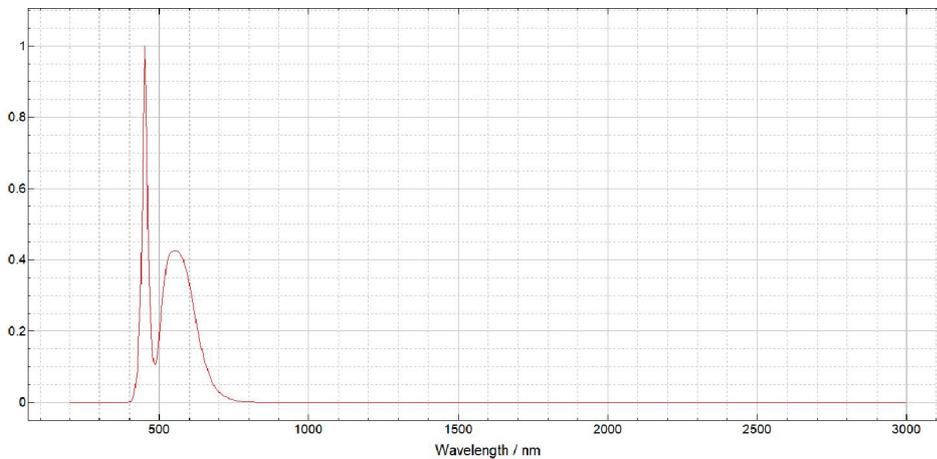
Appendix 3: Relative Spectrum Of Tested Sample(s)



L170-3070701200000



L170-4070701200000



L170-6570701200000

Appendix 4: Table 6.1 Based On IEC 62471:2006

DUT: L170-3070701200000 (1200mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α : 100 mrad

IEC 62471									
Clause	Requirement + Test			Result – Remark				Verdict	
Table 6.1 Emission limits for risk groups of continuous wave lamps									
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	4,59E+02	10000	1,06E+04	4000000	1,06E+04
Blue light, small source	$B(\lambda)$	E_B	$W \cdot m^{-2}$	1,0*	--	1,0	--	400	--
Retinal thermal	$R(\lambda)$	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	$28000/\alpha$	1,60E+05	$28000/\alpha$		$71000/\alpha$	
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	0,14	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									

DUT: L170-3070701200000 (1100mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α : 100 mrad

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict

Table 6.1 Emission limits for risk groups of continuous wave lamps									
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	4,57E+02	10000	9,96E+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	1,60E+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	0,14	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									

DUT: L170-4070701200000 (1200mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α : 100 mrad

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict

Table 6.1 Emission limits for risk groups of continuous wave lamps									
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	6,21E+02	10000	1,64E+04	4000000	1,81E+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	2,24E+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	0,10	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									

DUT: L170-4070701200000 (650mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α : 100 mrad

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict

Table 6.1 Emission limits for risk groups of continuous wave lamps									
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	4,52E+02	10000	9,92E+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	1,38E+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	0,11	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									

DUT: L170-6570701200000 (1200mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α : 100 mrad

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict

Table 6.1 Emission limits for risk groups of continuous wave lamps									
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	1,12E+03	10000	2,98E+04	4000000	3,73E+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	3,42E+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	0,10	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									

DUT: L170-6570701200000 (330mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α : 100 mrad

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict

Table 6.1 Emission limits for risk groups of continuous wave lamps									
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	4,19E+02	10000	9,90E+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	1,15E+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	0,08	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: L170-3070701200000 (1200mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α : 100 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)								
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	4,59E+02	10000	1,06E+04	4000000	1,06E+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	1,60E+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	0,14	570		3200	
<p>* 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 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>									

DUT: L170-3070701200000 (1100mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α : 100 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)									
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	4,57E+02	10000	9,96E+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	1,60E+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	0,14	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

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.

DUT: L170-4070701200000 (1200mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α : 100 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)								
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	6,21E+02	10000	1,64E+04	4000000	1,81E+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	2,24E+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	0,10	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>									

DUT: L170-4070701200000 (650mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α : 100 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)								
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	4,52E+02	10000	9,92E+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	1,38E+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	0,11	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>									

DUT: L170-6570701200000 (1200mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α : 100 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)								
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	1,12E+03	10000	2,98E+04	4000000	3,73E+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	3,42E+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	0,10	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>									

DUT: L170-6570701200000 (330mA), Evaluation Distance: 200mm, Angular subtense of the apparent source α : 100 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)									
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	4,19E+02	10000	9,90E+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	1,15E+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	0,08	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

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.

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