




<p align="center">TEST REPORT IEC TR 62778 Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires</p>	
Report Number.....	6165570.50P
Date of issue	2023-07-25
Total number of pages	19
<p>Name of Testing Laboratory preparing the Report DEKRA Testing and Certification (Shanghai) Ltd. 3/F, #250, Jiangchangsan Road building 16 Headquater Economy Park Shibei Hi-Tech Park, Zhabei District, Shanghai, P.R.C 200436</p>	
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
<p>Test specification:</p> <p>Standard IEC TR 62778:2014 (Second Edition)</p> <p>Test procedure Type test</p> <p>Non-standard test method N/A</p>	
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 package	
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	
Model/Type reference	L150-AABB5030XXSX; L150-AABB5006XXSX; L150-NSC15030XXSX; L150-NSC15006XXSX	
Ratings	For details see Model list	
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)	Nancy Wang	
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)		

List of Attachments (including a total number of pages in each attachment): <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 6.1Based On IEC 62471:2006 ● Appendix 5: Table 6.1 Based On EN62471:2008, Attachment To IEC 62471 European Group Differences And National Differences 	
Summary of testing:	
Tests performed (name of test and test clause): These tests fulfil the requirements of standard ISO/IEC 17025. When determining the test conclusion, the Measurement Uncertainty of test has been considered. The tested sample of L150-65705030000S0 (240mA) Have been tested according to the IEC/TR62778:2014 and been classified as RG 2 for blue light hazard . The tested sample of L150-NSC15030000S0 (800mA) Have been tested according to the IEC/TR62778:2014 and been classified as RG 1 Unlimited for blue light hazard .	Testing location: DEKRA Testing and Certification (Shanghai) Ltd. 3/F, #250, Jiangchangsan Road building 16 Headquater Economy Park Shibei Hi-Tech Park, Zhabei District, Shanghai, P.R.C 200436
Summary of compliance with National Differences (List of countries addressed):EN Standards EN 62471:2008 <input checked="" type="checkbox"/> The product fulfils 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 checked="" type="checkbox"/> LED package <input type="checkbox"/> LED module <input type="checkbox"/> Lamp <input type="checkbox"/> Luminaire
Rated voltage (V)	--
Rated current (mA)	For details see Model list
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	2023-07-20
Date (s) of performance of tests	2023-07-25
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 IEC60060-2:	
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

General product information:

Full tests were performed on model L150-65705030000S0 and L150-NSC15030000S0.

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

The sample of L150-65705030000S0 was tested at 200mm from the light source. CCT of spectral irradiance was found at 6482 K.

The sample of L150-NSC15030000S0 was tested at 200mm from the light source. CCT of spectral irradiance was found at 1960 K.

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.

Amendment 1 report:

The original test report 6054957.50P, dated 2019-07-08 was modified to include the following additions:

- New model L150-NSC15030000S0 and L150-NSC15006000S0 was added.

After review, full tests were performed on model L150-NSC15030000S0.

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	L150-NSC15030000S0	P
	- E_{thr} (lx) : - Distance to reach RG1..... (mm) ::	L150-65705030000S0 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.....	L150-65705030000S0 (240mA)			
	Test voltage (V)	--			—
	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 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	6482	
x/y colour coordinates				0,3126/0,3326	
Blue light hazard radiance		L _B	W/(m ² •sr ¹)	2,18E+04	@11mrad
Blue light hazard irradiance		E _B	W/m ²	--	
Luminance		L	cd/m ²	2,52E+07	@11mrad
Illuminance		E	lx	8,38E+03	
Supplementary information: Per IEC/TR 62778:2014 Ethr= 1154 lx Dmin= 508 mm					

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.....	L150-NSC15030000S0 (800mA)			
	Test voltage (V)	--			—
	Test current (mA)	800 mA			—
	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	1960	
x/y colour coordinates				0,5434/0,4286	
Blue light hazard radiance		L _B	W/(m ² •sr ¹)	1,44E+03	@11mrad
Blue light hazard irradiance		E _B	W/m ²	--	
Luminance		L	cd/m ²	2,31E+07	@11mrad
Illuminance		E	lx	1,36E+03	
Supplementary information: N/A					

IEC TR 62778			
Clause	Requirement + Test	Result - Remark	Verdict

	TABLE: Angular light distribution	N/A

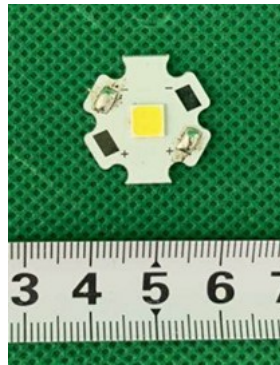
List of test equipment used:

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	2023/2/25	2024/2/24
7	Irradiance measurements	CL6 Spectral irradiance standard (SH 350)	300-3000nm	2023/2/25	2024/2/24
7	Irradiance measurements	CL7 Spectral irradiance standard (SH 351)	200-400nm	2023/2/25	2024/2/24
7	Irradiance measurements	Photometric detector head (SH 359)	380nm-800nm	2023/2/26	2024/2/25
7	Irradiance measurements Radiance measurements	Wattmeter (SH030)	500V,40A	2022/10/10	2023/10/10

Appendix 1: Photo Documentation



L150-65705030000S0



L150-NSC15030000S0

Appendix 2: Model List:

Commercial Part number	LES (mm)	Max Current (mA)	Max Voltage (V)	Nominal CCT (K)	Minimum CRI	Typical Flux (lm)	Typ Flux Density (lm/mm ²)	Forward Current (mA)
L150-AABB5006XXXSX	4,5	1000	6,4	1800~6500	70	825	41	800
L150-AABB5030XXXSX	4,5	240	32	1800~6500	70	825	41	160
L150-NSC15030XXXSX	4,5	240	32	1800	50	695	35	160
L150-NSC15006XXXSX	4,5	1000	32	1800	50	695	35	800
L150-AABB5006XXXNX	4,5	800	6,4	1800~6500	70	700	35	640

Note:

AA—designates nominal ANSI CCT (**18=1800K**, 22=2200K, 27=2700K, 30=3000K, 35=3500K 40=4000K, 50=5000K, 57=5700K, 65=6500K);

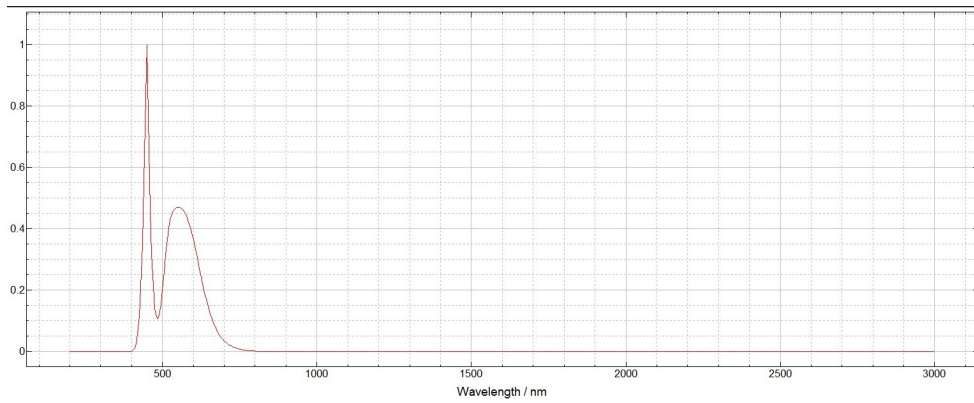
BB—designates minimum CRI (70=70CRI, 80=80CRI, 90=90CRI 95=95CRI);

NSC1: designates Nightscape;

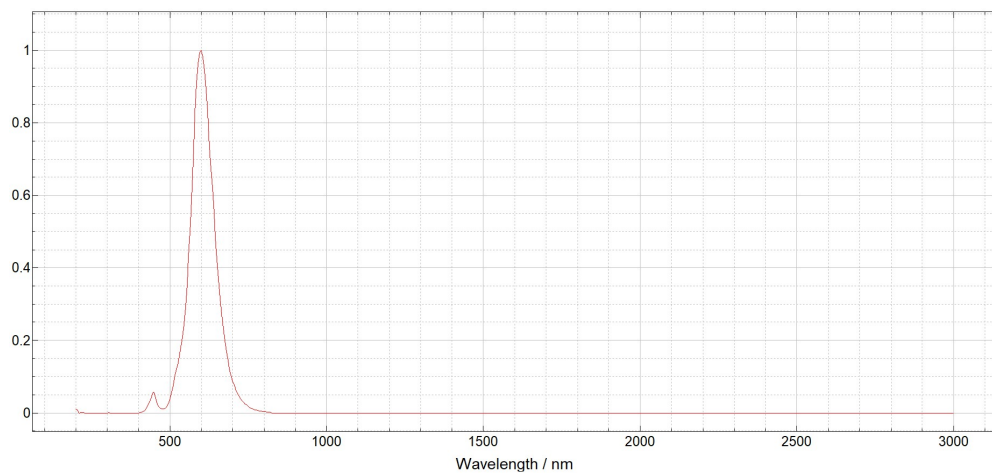
XXX— Design for customer;

X—Version

Appendix 3: Relative Spectrum Of Tested Sample(s)



L150-65705030000S0



L150-NSC15030000S0

Appendix 4: Table 6.1 Based On IEC 62471:2006

DUT: L150-65705030000S0, Evaluation Distance: 200mm, Test current: 240mA, Angular subtense of the apparent source α : 20.4 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	8,08E+02	10000	2,18E+04	4000000	7,02E+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	2,63E+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	0,02	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: L150-NSC15030000S0, Evaluation Distance: 200mm, Test current: 800mA, Angular subtense of the apparent source α : 20.4 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	9,80E+01	10000		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	7,37E+04	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	0,06	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: L150-65705030000S0, Evaluation Distance: 200mm, Test current: 240mA, Angular subtense of the apparent source α : 20.4mrad

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	8,08E+02	10000	2,18E+04	4000000	7,02E+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	2,63E+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	0,02	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: L150-NSC15030000S0, Evaluation Distance: 200mm, Test current: 800mA, Angular subtense of the apparent source α : 20.4mrad

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	9,80E+01	10000		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	7,37E+04	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	0,06	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.

-----End-----