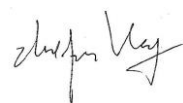



Test Report issued under the responsibility of:



TEST REPORT IEC TR 62778 Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires	
Report Number :	3192041.51P
Date of issue	2016-08-09
Total number of pages	16
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	Lumileds Malaysia Sdn. Bhd.
Address :	LebuKampung Jawa Bayan Lepas FIZ, Phase 3 11900 Penang, Malaysia
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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This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.	
General disclaimer:	
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Test item description	LED chip	
Trade Mark	LUMILEDS	
Manufacturer	Lumileds Malaysia Sdn. Bhd. Lebuh Kampung Jawa Bayan Lepas FIZ, Phase 3 11900 Penang, Malaysia	
Model/Type reference	LUXEON 3535L HE Plus series Detailed lists refer to Appendix 2: Model List	
Ratings	Max. 3,1Vdc, Max. 300mA Detailed information please refer to Appendix 2: 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 Headquarter 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)	Zhijun 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)		

<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 L135-5080CA35000P1 from LUXEON 3535L HE Plus series list at appendix 2 Have been tested according to the IEC 62471 (first edition, 2006-07) at 200mm and been classified as Risk 0. Have been tested according to the EN 62471:2008 at 200mm and been classified as Risk 1. Have been tested according to the IEC/TR62778:2014 and been classified as Risk 1 Unlimited 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 fulfils 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

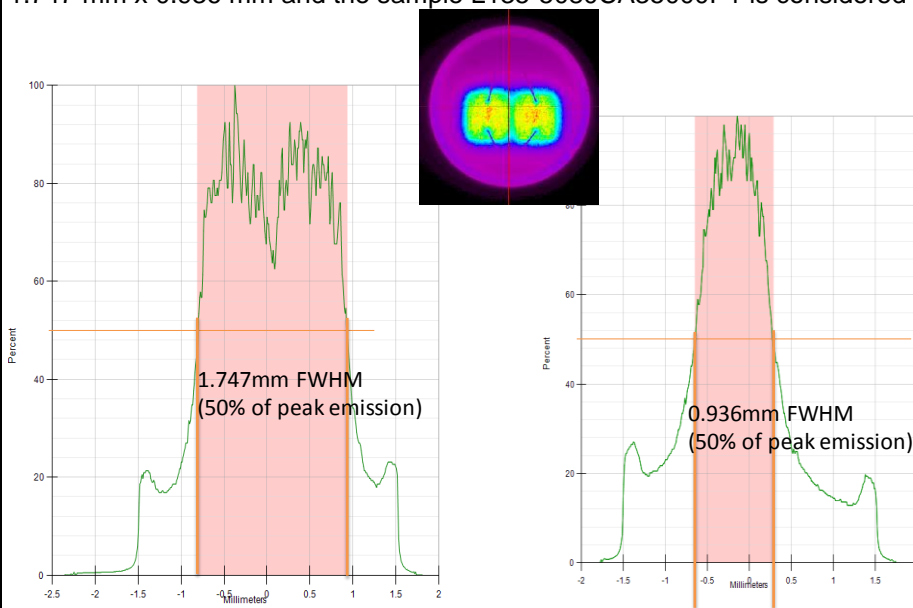
Test item particulars.....: See below	
Product evaluated.....:	<input checked="" type="checkbox"/> LED package <input type="checkbox"/> LED module <input type="checkbox"/> Lamp <input type="checkbox"/> Luminaire
Rated voltage (V)	Max. 3,1Vdc
Rated current (mA)	Max. 300mA
Rated CCT (K).....:	2700 K / 3000 K / 3500 K / 4000 K / 5000K Details information please refer to Appendix 2: Model List.
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	2016-07-01
Date (s) of performance of tests	2016-07-01 to 2016-08-09
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 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 Malaysia Sdn. Bhd.
 Lebuh Kampung Jawa Bayan Lepas FIZ, Phase 3
 11900 Penang, Malaysia

General product information:

The pink shaded area is the 50% of the max emission point. The diameter for the source size is therefore 1.747 mm x 0.936 mm and the sample L135-5080CA35000P1 is considered small source.



L135-5080CA35000P1 is part of the product family LUXEON 3535L HE Plus. The sample measured L135-5080CA35000P1, is ANSI bin 5000K. The present classification is thus valid (worst case) for all LUXEON 3535L HE Plus L135-AABB-CA35000P1 where AA is the CCT bins can be equal to 5000K or lower and BB is the CRI can be 70-90 (see TR IEC62778)". See appendix below for an explanation of the type of designation.

Full tests were performed on model L135-5080CA35000P1.

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

The sample of L135-5080CA35000P1 was tested at 200mm from the light source. CCT of spectral irradiance was found at 5282 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.

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		P
	- E_{thr} (lx) :		N/A
	- Distance to reach RG1..... (m) ::		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	L135-5080CA35000P1		
	Test voltage (V)	3,1 Vdc		—
	Test current (mA)	300 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 :1,747 mm x 0,936 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	Symb ol	Units	Result	Remark
Correlated colour temperature	CCT	K	5282	
x/y colour coordinates			0,3380/ 0,3541	
Blue light hazard radiance	L _B	W/(m ² •sr ¹)	--	@11mrad
Blue light hazard irradiance	E _B	W/m ²	0,76E+00	
Luminance	L	cd/m ²	9,88E+06	@11mrad
Illuminance	E	lx	1,11E+03	
Supplementary information: N/A				

IEC TR 62778			
Clause	Requirement + Test	Result - Remark	Verdict

	TABLE: Angular light distribution	N/A

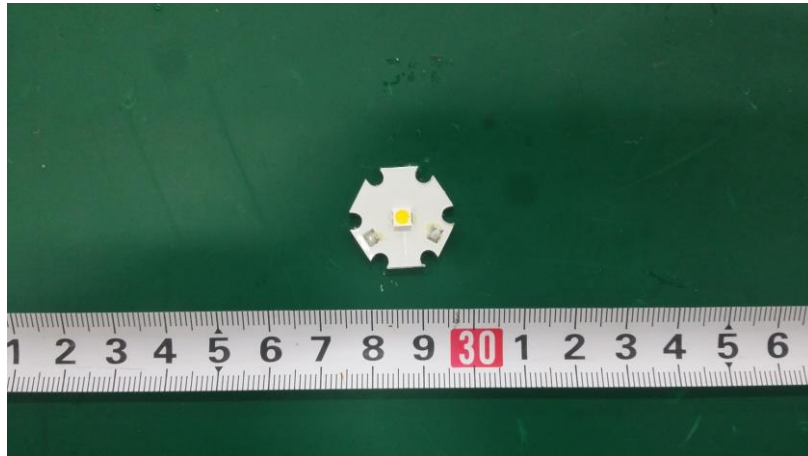
List of test equipment used:

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	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	2015/10/16	2016/10/16

Appendix 1: Photo Documentation

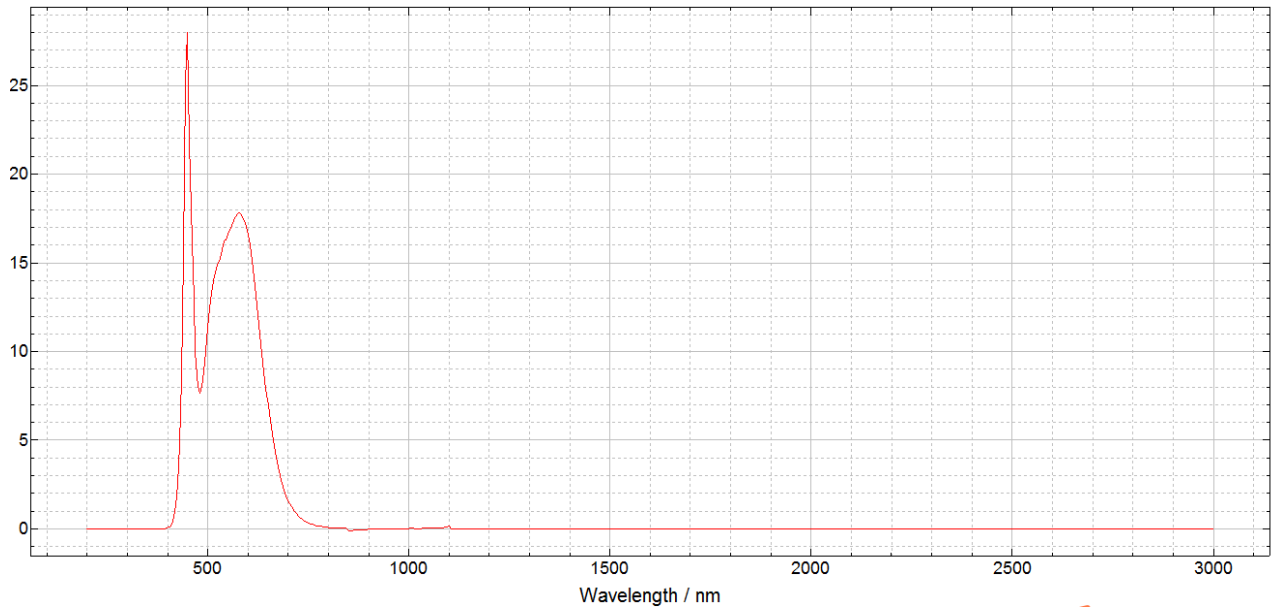


Overview (tested)

Appendix 2: Model List:

Part number	CRI	CCT (K)	LED Junction Temperature (°C)	Max Voltage (V)	Max Current (mA)
L135-2780CA35000P1	80	2700	125	3.1	300
L135-3080CA35000P1	80	3000	125	3.1	300
L135-3580CA35000P1	80	3500	125	3.1	300
L135-4080CA35000P1	80	4000	125	3.1	300
L135-5080CA35000P1	80	5000	125	3.1	300
L135-2770CA35000P1	70	2700	125	3.1	300
L135-3070CA35000P1	70	3000	125	3.1	300
L135-3570CA35000P1	70	3500	125	3.1	300
L135-4070CA35000P1	70	4000	125	3.1	300
L135-5070CA35000P1	70	5000	125	3.1	300
L135-2790CA35000P1	90	2700	125	3.1	300
L135-3090CA35000P1	90	3000	125	3.1	300
L135-3590CA35000P1	90	3500	125	3.1	300
L135-4090CA35000P1	90	4000	125	3.1	300
L135-5090CA35000P1	90	5000	125	3.1	300

Appendix 3: Relative Spectrum Of Tested Sample(s)



Appendix 4: Table 6.1 Based On IEC 62471:2006

DUT: L135-5080CA35000P1, Evaluation Distance: 200mm, Test current: 300mA, Angular subtense of the apparent source α : 6,7075mrad

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	--	10000		4000000	
Blue light, small source	$B(\lambda)$	E_B	$W \cdot m^{-2}$	1,0*	0,76E+00	1,0		400	
Retinal thermal	$R(\lambda)$	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	$28000/\alpha$	$1,14E+05$	$28000/\alpha$		$71000/\alpha$	
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	0,005	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: L135-5080CA35000P1, Evaluation Distance: 200mm, Test current: 300mA, Angular subtense of the apparent source α : 6,7075mrad

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	--	10000		4000000		
Blue light, small source	$B(\lambda)$	E_B	$W \cdot m^{-2}$	0,01*	0,76E+00	1,0	0,76E+00	400		
Retinal thermal	$R(\lambda)$	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/ α	1,14E+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	0,005	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>										