



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..... :** 3196890.51P

**Date of issue ..... :** 2016-10-08

**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 Shibei Hi-Tech Park, Zhabei District, Shanghai,  
P.R.C 200436

**Applicant's name ..... :** Lumileds Malaysia Sdn. Bhd.

**Address..... :** Lebuhr Kampung Jawa Bayan Lepas FIZ, Phase 3 11900  
Penang, Malaysia

**Test specification:**

**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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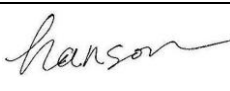
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<b>Test item description</b> .....	LUXEON SunPlus 35 Line	
<b>Trade Mark</b> .....	LUMILEDS	
<b>Manufacturer</b> .....	Lumileds Malaysia Sdn. Bhd. Lebuh Kampung Jawa Bayan Lepas FIZ, Phase 3 11900 Penang, Malaysia	
<b>Model/Type reference</b> .....	LUXEON SunPlus 35 Line series Detailed lists refer to Appendix 2: Model List	
<b>Ratings</b> .....	Max current: 300 mA, Max voltage: 3,1 Vdc Detailed 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.	
<b>Testing location/ address</b> .....	3/F, #250, Jiangchangsan Road building 16 Headquarter Economy Park Shibei Hi-Tech Park, Zhabei District, Shanghai, P.R.C 200436	
<input type="checkbox"/> <b>Associated CB Testing Laboratory:</b>		
<b>Testing location/ address</b> .....		
<b>Tested by (name, function, signature)</b> .....	Yuelie Wu	
<b>Approved by (name, function, signature)</b> ...	Hanson Zhang	
<b>Testing procedure: CTF Stage 1:</b>		
<b>Testing location/ address</b> .....		
<b>Tested by (name, function, signature)</b> .....		
<b>Approved by (name, function, signature)</b> .....		
<b>Testing procedure: CTF Stage 2:</b>		
<b>Testing location/ address</b> .....		
<b>Tested by (name + signature)</b> .....		
<b>Witnessed by (name, function, signature)</b> .....		
<b>Approved by (name, function, signature)</b> .....		
<b>Testing procedure: CTF Stage 3:</b>		
<b>Testing procedure: CTF Stage 4:</b>		
<b>Testing location/ address</b> .....		

Tested by (name, function, signature) .....		
Witnessed by (name, function, signature) .....		
Approved by (name, function, signature) .....		
Supervised by (name, function, signature) .....		

<b>List of Attachments (including a total number of pages in each attachment):</b> <ul style="list-style-type: none"><li>● Appendix 1: Photo Documentation</li><li>● Appendix 2: Model List</li><li>● Appendix 3: Relative Spectrum Of Tested Sample(s)</li><li>● Appendix 4: Table 6.1 Based On IEC 62471:2006</li><li>● Appendix 5: Table 6.1 Based On EN62471:2008, Attachment To IEC 62471 European Group Differences And National Differences</li></ul>	
<b>Summary of testing:</b>	
<b>Tests performed (name of test and test clause):</b> <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 L1SP-RYL0003500000 from LUXEON SunPlus 35 Line series list at appendix 2 Have been tested according to the IEC 62471 (first edition, 2006-07) <b>at 200mm</b> and been classified as <b>RG 2</b>. Have been tested according to the EN 62471:2008 <b>at 200mm</b> and been classified as <b>RG 2</b>. Have been tested according to the IEC/TR62778:2014 and been classified as <b>RG 2 for blue light hazard</b></p>	<b>Testing location:</b> <p>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>
<b>Summary of compliance with National Differences (List of countries addressed):</b> EN Standards	
EN 62471:2008	
<input checked="" type="checkbox"/> <b>The product fulfils the requirements</b>	

**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

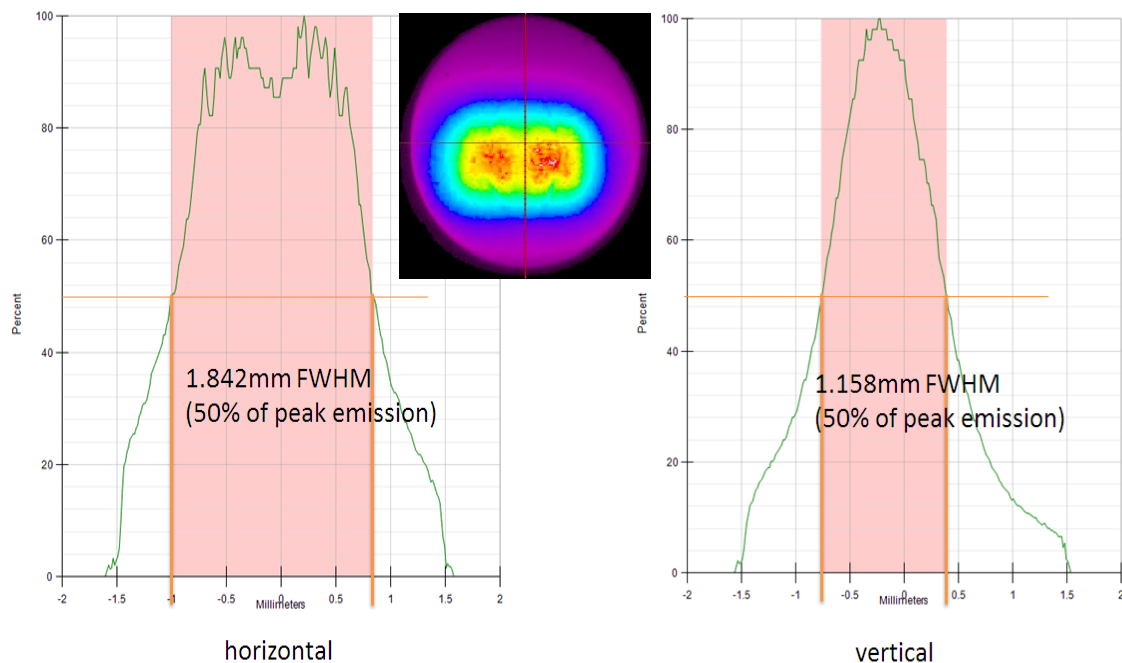
<b>Test item particulars.....:</b> See below	
<b>Product evaluated.....:</b>	<input checked="" type="checkbox"/> LED package <input type="checkbox"/> LED module <input type="checkbox"/> Lamp <input type="checkbox"/> Luminaire
<b>Rated voltage (V) .....</b>	Max: 3,1 Vdc
<b>Rated current (mA) .....</b>	Max: 300 mA
<b>Rated CCT (K).....</b>	--
<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 Report number: --
<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> : 2016-09-20	
<b>Date (s) of performance of tests .....</b> : 2016-09-20 to 2016-10-08	
<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.  <b>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: <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 IEC60060-2:</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"/> 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 1,842mm x 1,158mm and the sample L1SP-RYL0003500000 is considered small source.



L1SP-RYL0003500000, is part of the product family LUXEON SunPlus 35 Line. The sample measured L1SP-RYL0003500000, has the highest blue content for the parts covered in this report. The present classification is thus valid (worst case) for all LUXEON SunPlus 35 Line products with part number L1SP-AAABB0CC00000 where AAA designates color (RYL= Royal blue, PRP=Purple, LME=Lime) and BB designates percentage of blue power for purple parts (05=7.5% blue, 10=12.5% blue, 15=17.5% blue, 20=25% blue, 00=2.5% blue and all colors such as Lime). See appendix below for an explanation of the type of designation.

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

The sample of L1SP-RYL0003500000 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
<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		N/A
	- $E_{thr}$ ..... (lx) : - Distance to reach RG1 ..... (mm) ::	Refer to the Supplementary information of <b>TABLE: Spectroradiometric measurement</b> 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.....		L1SP-RYL0003500000		
	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 : 1,842 mm x 1,158 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	--	
x/y colour coordinates				--	
Blue light hazard radiance		L <sub>B</sub>	W/(m <sup>2</sup> •sr <sup>1</sup> )	--	@11mrad
Blue light hazard irradiance		E <sub>B</sub>	W/m <sup>2</sup>	3,33E+00	
Luminance		L	cd/m <sup>2</sup>	9,37E+05	@11mrad
Illuminance		E	lx	1,10E+02	
Supplementary information:					
Per IEC/TR 62778:2014					
Eth <sub>r</sub> = 33 lx					
D <sub>min</sub> = 365 mm					

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

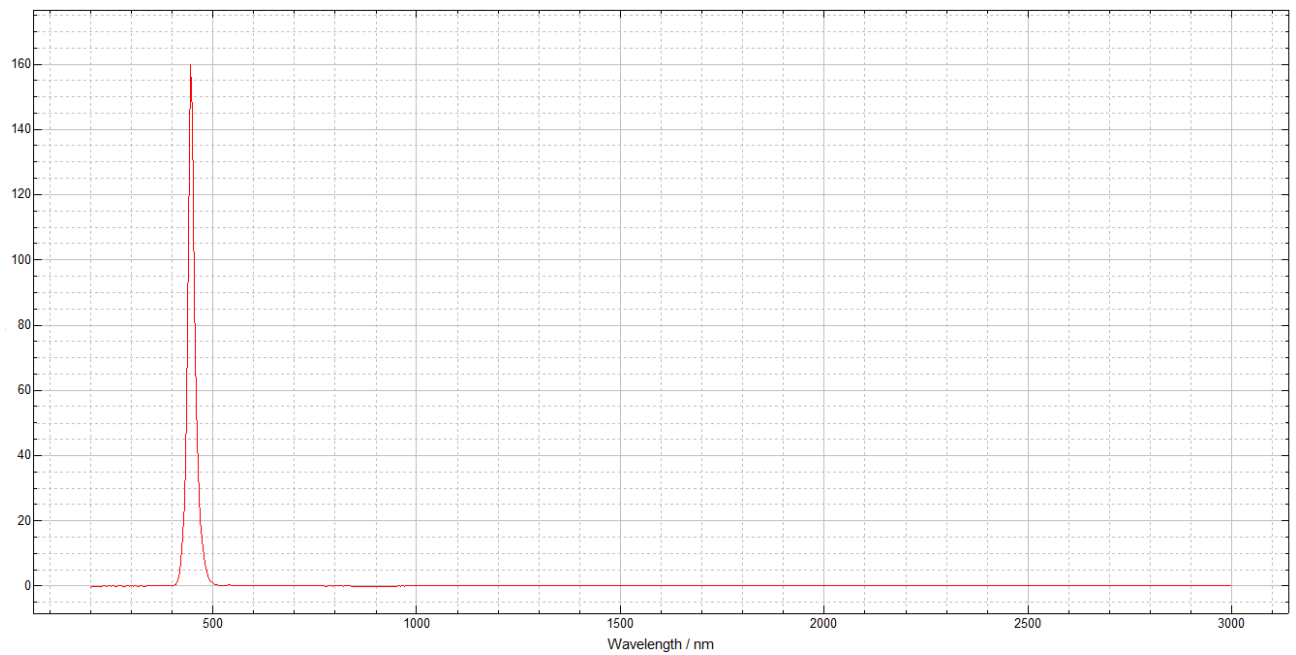
Appendix 1: Photo Documentation



Overview (tested)



## Appendix 3: Relative Spectrum of Tested Sample(s)



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

DUT: L1SP-RYL0003500000, Evaluation Distance: 200mm, Test current: 300mA, Angular subtense of the apparent source  $\alpha$ : 7,5mrad

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*	3,33E+00	1,0	3,33E+00	400	3,33E+00
Retinal thermal	$R(\lambda)$	$L_R$	$W \cdot m^{-2} \cdot sr^{-1}$	28000/ $\alpha$	3,00E+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	0,00	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: L1SP-RYL0003500000, Evaluation Distance: 200mm, Test current: 300mA, Angular subtense of the apparent source  $\alpha$ : 7,5mrad

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*	3,33E+00	1,0	3,33E+00	400	3,33E+00
Retinal thermal	$R(\lambda)$	$L_R$	$W \cdot m^{-2} \cdot sr^{-1}$	28000/ $\alpha$	3,00E+05	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	--				
				6000/ $\alpha$ 0,011 $\leq \alpha \leq$ 0,1	--				
IR radiation, eye		$E_{IR}$	$W \cdot m^{-2}$	100	0,00	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.