
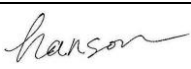




Test Report issued under the responsibility of:



TEST REPORT IEC TR 62778 Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires	
Report Number.....	6011678.50P
Date of issue	2017-06-20
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.....	No. 3 , Lintang Bayan Lepas 8, Phase 4, Bayan Lepas Industrial Park, 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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Test item description	LUXEON V	
Trade Mark	LUMILEDS	
Manufacturer	Lumileds Malaysia Sdn. Bhd. No. 3 , Lintang Bayan Lepas 8, Phase 4, Bayan Lepas Industrial Park, 11900 Penang, Malaysia	
Model/Type reference	LUXEON V series Detailed lists refer to Appendix 2: Model List	
Ratings	Max Current: 5600mA, Max Voltage: 3,2Vdc 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 Shibei 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	
Testing procedure: CTF Stage 1:		
Testing location/ address		
Tested by (name, function, signature)		
Approved by (name, function, signature)		
Testing procedure: CTF Stage 2:		
Testing location/ address		
Tested by (name + signature)		
Witnessed by (name, function, signature)		
Approved by (name, function, signature)		
Testing procedure: CTF Stage 3:		
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): <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 L1V1-657003V700000 from LUXEON V series list at appendix 2 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/TR62778:2014 and been classified as RG 2 for blue light hazard</p>	Testing location: <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>
Summary of compliance with National Differences (List of countries addressed):EN Standards <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: 3,2Vdc
Rated current (mA)	Max: 5600mA
Rated CCT (K).....:	2200K / 2700K / 3000K / 3500K / 4000K / 5000K / 5700K / 6500K 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	2017-02-05
Date (s) of performance of tests	2017-02-05 to 2017-02-06
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 60598-2-15:	

<p>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</p>	<p><input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable</p>
<p>When differences exist; they shall be identified in the General product information section.</p>	
<p>Name and address of factory (ies) : Lumileds Malaysia Sdn. Bhd. No. 3 , Lintang Bayan Lepas 8, Phase 4, Bayan Lepas Industrial Park, 11900 Penang, Malaysia</p>	
<p>General product information:</p> <p>L1V1-657003V700000, with ANSI bin 6500K, is part of the product family LUXEON V. The sample measured L1V1-657003V700000 is with highest CCT and lowest CRI within the family. The present classification is thus valid (worst case) for all listed LUXEON V L1V1-AABBCCCD0EEEE where AA is the CCT bins can be equal to 6500K or lower and BB is the CRI can be 70-90 (see TR IEC62778). See the appendix below for an explanation of the type designation.</p> <p>The products considered as worst case which should be evaluated at 200mm.</p> <p>The sample of L1V1-657003V700000 was tested at 200mm from the light source. CCT of spectral irradiance was found at 6549K.</p> <p>Base on the Model list which listed on the appendix 2, The tested sample can be considered as <input type="checkbox"/> typical product <input checked="" type="checkbox"/> worst product Which the results can be reference used for the other models.</p>	

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		N/A
	- E_{thr} (lx) : - Distance to reach RG1..... (mm) ::	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	L1V1-657003V700000			
	Test voltage (V)	3,2Vdc			—
	Test current (mA)	5600mA			—
	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	6549	
x/y colour coordinates				0,3121/ 0,3279	
Blue light hazard radiance		L _B	W/(m ² •sr ¹)	9,06E+04	@11mrad
Blue light hazard irradiance		E _B	W/m ²	--	
Luminance		L	cd/m ²	9,23E+07	@11mrad
Illuminance		E	lx	1,48E+02	
Supplementary information: Per IEC/TR 62778:2014 Ethr=1018 lx Dmin= 761 mm					

IEC TR 62778			
Clause	Requirement + Test	Result - Remark	Verdict

	TABLE: Angular light distribution	N/A

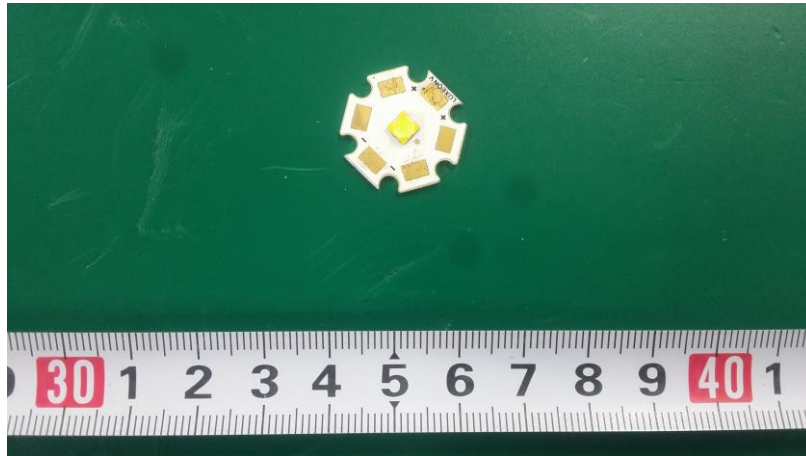
List of test equipment used:

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	2017/4/25	2018/4/25
7	Irradiance measurements	CL6 Spectral irradiance standard (SH 350)	300-3000nm	2017/4/25	2018/4/25
7	Irradiance measurements	CL7 Spectral irradiance standard (SH 351)	200-400nm	2017/4/25	2018/4/25
7	Irradiance measurements	Photometric detector head (SH 359)	380nm-800nm	2017/4/25	2018/4/25
7	Irradiance measurements Radiance measurements	Wattmeter (SH070)	500V,40A	2016/10/12	2017/10/12

Appendix 1: Photo Documentation



Overview (tested)

Appendix 2: Model List:

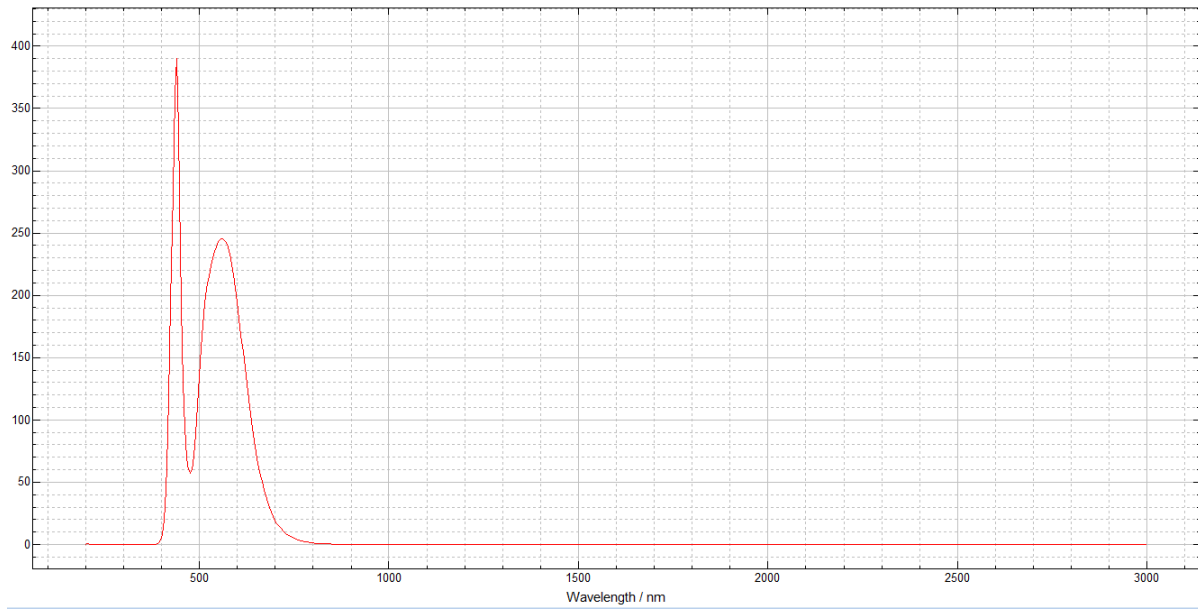
Part number submitted for type testing as following:

Part number	CCT (K)	CRI	Max Voltage(V)	Max Current (mA)
L1V1-657003V700000	6500	70	3.2	5600

L1V1-657003V700000, with ANSI bin 6500K, is part of the product family LUXEON V. The sample measured L1V1-657003V700000 is with highest CCT and lowest CRI within the family. The present classification is thus valid (worst case) for all listed LUXEON V L1V1-AABBCCCD0EEEE where AA is the CCT bins can be equal to 6500K or lower and BB is the CRI can be 70-90 (see TR IEC62778). See the appendix below for an explanation of the type designation.

Part number	Designates nominal ANSI CCT /CCT (K)	designates minimum CRI	Max Voltage(V)	Max Current (mA)
L1V1-AABB03VD0EEEE	AA	BB	3.2	5600
<p>L1V1-AABBCCCD0EEEE</p> <p>Where</p> <p>AA - designates nominal ANSI CCT (27=2700K, 30=3000K, 35=3500K, 40=4000K, 50=5000K, 57=5700K, 65=6500K)</p> <p>BB - designates minimum CRI (70=70CRI, 80=80CRI, 90=90CRI)</p> <p>CCC - designates voltage (03V=3V)</p> <p>D - designates SCMD (3=3-step MacAdam ellipse, 5=5-step MacAdam ellipse, 7=7-step MacAdam ellipse)</p> <p>EEEE - designates minimum luminous flux (optional)</p>				

Appendix 3: Relative Spectrum Of Tested Sample(s)



Appendix 4: Table 6.1 Based On IEC 62471:2006

DUT: L1V1-657003V700000, Evaluation Distance: 200mm, Test current: 5600mA, Angular subtense of the apparent source α : 15,7mrad

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	1,57E+03	10000	9,06E+04	4000000	4,54E+05
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	1,07E+06	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	0,07	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: L1V1-657003V700000, Evaluation Distance: 200mm, Test current: 5600mA, Angular subtense of the apparent source α : 15,7mrad

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	1,57E+03	10000	9,06E+04	4000000	4,54E+05
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	1,07E+06	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	0,07	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.