

TEST REPORT IEC 62471:2006 Photobiological safety of lamps and lamp systems	
Report reference No	SZ2231010-58974E-SF
Compiled by (+ signature)	Engineer: Vic Zhang
Approved by (+ signature)	Team Leader: Harrison Huang
Date of issue	2023-10-17
Testing laboratory	Bay Area Compliance Laboratories Corp. (Dongguan)
Address	No.12, Pulong East 1 st Road, Tangxia Town, Dongguan, Guangdong, China
Testing location	Same as above
Applicant	Hongli Zhihui Group Co.,Ltd. Guangzhou Branch
Address	Room 316, Building 2, No.1, Xianke Yi Road, Huadong Town, Huadu District, Guangzhou, China
Standard	IEC 62471:2006
Test sample(s) received.....	2023-10-11
Test in period.....	2023-10-12
Procedure deviation	N.A.
Non-standard test method	N.A.
Type of test object	LED package
Trademark	N.A.
Model/type reference	HL-LM104H384W-5B2C12 (Ra2)-S
Manufacturer.....	Hongli Zhihui Group Co.,Ltd. Guangzhou Branch Room 316, Building 2, No.1, Xianke Yi Road, Huadong Town, Huadu District, Guangzhou, China
Rating	Input:34-40Vdc,0.200A
Copy of marking plate:	None

Test item particulars

Tested lamp: LED package

Tested lamp system:N.A

Lamp classification group.....: Risk Group 1

Lamp cap:N.A

Bulb.....:N.A

Rated of the lamp:See rating

Furthermore marking on the lamp.....: N.A.

Seasoning of lamps according EN standard: No seasoning

Temperature by measurement.....:22°C

Information for safety use.....:N.A

Possible test case verdicts:

-test case does not apply to the test object.....:N(.A.)

-test object does meet the requirement.....:P(ass)

-test object does not meet the requirement.....:F(ail)

General remarks:

The test results presented in this report relate only to the object tested.

This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.

"(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 point is used as the decimal separator.

List of test equipment must be kept on file and available for review.

Remark:

Appendix A - EUT photos

General Product Information:

"EUT" as referred in this report is LED package.

IEC 62471:2006			
Clause	Requirement – Test	Result - Remark	Verdict
4	EXPOSURE LIMITS		P
	Contents of the whole Clause 4 of IEC 62471: 2006 moved into a new informative Annex ZB		P
	Clause 4 replaced by the following:		P
	Limits of the Artificial Optical Radiation have been applied instead of those fixed in IEC 62471: 2006	See Table 6.1	P
Annex ZB	EXPOSURE LIMITS		P
4.1	General		P
	<p>Exposure limits in this standard is not less than 10⁴ cd·m⁻² and not more than any 8-hour period. Detailed spectral data of a light source are generally required only if the luminance of the source exceeds 10⁴ cd·m⁻².</p>	>10 ⁴	P

IEC 62471:2006			
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4.3.3	<p>Retinal blue light hazard exposure limit</p> <p>To protect against retinal photochemical injury from chronic blue-light exposure, the integrated spectral radiance of the light source weighted against the blue-light hazard function, $B(\lambda)$, i.e., the blue-light weighted radiance, L_B, shall not exceed</p>		P
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IEC 62471:2006			
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IEC 62471:2006			
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To standardize interpolated values, use linear

IEC 62471:2006			
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	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal hazard (LIR), within 100 s are in Risk Group 1.		P
6.1.3	Risk Group 2 (Moderate-Risk)		N
	This requirement is met by any lamp that exceeds the limits for Risk Group 1, but that does not pose:		N
	an actinic ultraviolet hazard (ES) within 1000 s exposure, nor		N
	a near ultraviolet hazard (EUVA) within 100 s, nor		N
	a retinal blue-light hazard (LB) within 0,25 s (aversion response), nor		N
	a retinal thermal hazard (LR) within 0,25 s (aversion response), nor		N
	an infrared radiation hazard for the eye (EIR) within 10 s		N
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal hazard (LIR), within 10 s are in Risk Group 2.		N
6.1.4	Risk Group 3 (High-Risk)		N
	Lamps which exceed the limits for Risk Group 2 are in Group 3.		N
6.2	Pulsed lamps		N
	Pulse lamp criteria shall apply to a single pulse and to any group of pulses within 0,25 s.		N
	A pulsed lamp shall be evaluated at the highest nominal energy loading as specified by the manufacturer.		N
	The risk group determination of the lamp being tested shall be made as follows:		N
	a lamp that exceeds the exposure limit shall be classified as belonging to Risk Group 3 (High-Risk)		N
	for single pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance does is below the EL shall be classified as belonging to the Exempt Group		N
	for repetitively pulsed lamps, a lamp whose weighted radiant exposure or weighted radiance dose is below the EL, shall be evaluated using the continuous wave risk criteria discussed in clause 6.1, using time averaged values of the pulsed emission		N

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Table 4.1		Spectral weighting function for assessing ultraviolet hazards for skin and eye		-
Wavelength ¹ λ , nm	UV hazard function $S_{UV}(\lambda)$	Wavelength λ , nm	UV hazard function $S_{UV}(\lambda)$	
200	0,030	313*	0,006	
205	0,051	315	0,003	
210	0,075	316	0,0024	
215	0,095	317	0,0020	
220	0,120	318	0,0016	
225	0,150	319	0,0012	
230	0,190	320	0,0010	
235	0,240	322	0,00067	
240	0,300	323	0,00054	
245	0,360	325	0,00050	
250	0,430	328	0,00044	
254*	0,500	330	0,00041	
255	0,520	333*	0,00037	
260	0,650	335	0,00034	
265	0,810	340	0,00028	
270	1,000	345	0,00024	
275	0,960	350	0,00020	
280*	0,880	355	0,00016	

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Table 4.2	Spectral weighting functions for assessing retinal hazards from broadband optical sources		-
Wavelength nm	Blue-light hazard function B()	Burn hazard function R()	
300	0,01	-	
305	0,01	-	
310	0,01	-	
315	0,01	-	
320	0,01	-	
325	0,01	-	
330	0,01	-	
335	0,01	-	
340	0,01	-	
345	0,01	-	
350	0,01	-	
355	0,01	-	
360	0,01	-	
365	0,01	-	
370	0,01	-	
375	0,01	-	
380	0,01	0,1	
385	0,013	0,13	
390	0,025	0,25	
395	0,05	0,5	
400	0,10	1,0	
405	0,20	2,0	
410	0,40	4,0	
415	0,80	8,0	
420	0,90	9,0	
425	0,95	9,5	
430	0,98	9,8	
435	1,00	10,0	
440	1,00	10,0	
445	0,97	9,7	
450	0,94	9,4	
455	0,90	9,0	
460	0,80	8,0	
465	0,70	7,0	
470	0,62	6,2	
475	0,55	5,5	
480	0,45	4,5	
485	0,40	4,0	
490	0,22	2,2	
495	0,16	1,6	
500-600	$10^{(450-)}$	1,0	
600-700	0,001	1,0	
700-1050	0,013	$10^{(700-)}$	
1050-1150	0,025	0,2	
1150-1200	0,05	$0,2 \cdot 100,02^{(1150-)}$	
1200-1400	0,10	0,02	

* Wavelengths chosen are representative: other values should be obtained by logarithmic interpolation at intermediate wavelengths.
*Emission lines of a mercury discharge spectrum.

IEC 62471:2006			
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Table 5.4 Summary of the ELs for the surface of the skin or cornea (irradiance based values)					-
Hazard Name	Relevant equation	Wavelength Range nm	Exposure aperture rad(deg)	Limiting aperture rad(deg)	EL in items of constant irradiance $W.m^{-2}$
Actinic UV skin & eye	E_S	200 400	< 30000	1,4 (80)	30/t
Eye UV-A	E_{UVA}	315 400	>1000	1,4 (80)	10000/t 10
Blue-light small source	E_B	300 700	>100	< 0,011	100/t 1,0
Eye IR	E_{IR}	780 3000	>1000	1,4 (80)	18000/t ^{0,75} 100
Skin thermal	E_H	380 3000	< 10		20000/t ^{0,75}

Table 5.5 Summary of the ELs for the retina (radiance based values)					-
Hazard Name	Relevant equation	Wavelength Range nm	Exposure duration Sec	Field of view radians	EL in terms of constant radiance $W.m^{-2}.sr^{-1}$
Blue light	L_B	300 700	0,25 10 10-100 100-10000	0,011 0,1	10 ⁶ /t 10 ⁶ /t 10 ⁶ /t 100
Retinal thermal	L_R	380 1400	< 0,25 0,25 10	0,0017	0,25) 0,25)
Retinal thermal (weak visual stimulus)	L_{IR}	780 1400	> 10	0,011	

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Clause	Requirement – Test	Result - Remark	Verdict
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Table 6.1		Emission limits for risk groups of continuous wave lamps							P
Risk	Action spectrum	Units	Symbol	Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV		$W.m^{-2}$	E_S	0.001	-	0.003	1.693×10^{-8}	0.03	-
Near UV		$W.m^{-2}$	E_{UVA}	10	-	33	5.123×10^{-4}	100	-
Blue light		$W.m^{-2}.sr^{-1}$	L_B	100	-	10000	9.265×10^3	4000000	-
Blue light, small source		$W.m^{-2}$	E_B	1.0	-	1.0	-	400	-
Retinal thermal		$W.m^{-2}.sr^{-1}$	L_R	(0.0265)	-	(0.0265)	1.129×10^5	(0.0265)	-
Retinal thermal, Weak visual stimulus**		$W.m^{-2}.sr^{-1}$	L_{IR}	(0.0265)	-	(0.0265)	1.119×10^1	(0.0265)	-
IR radiation Eye		$W.m^{-2}$	E_{IR}	100	-	570	0	3200	-

** Involves evaluation of non-GLS source

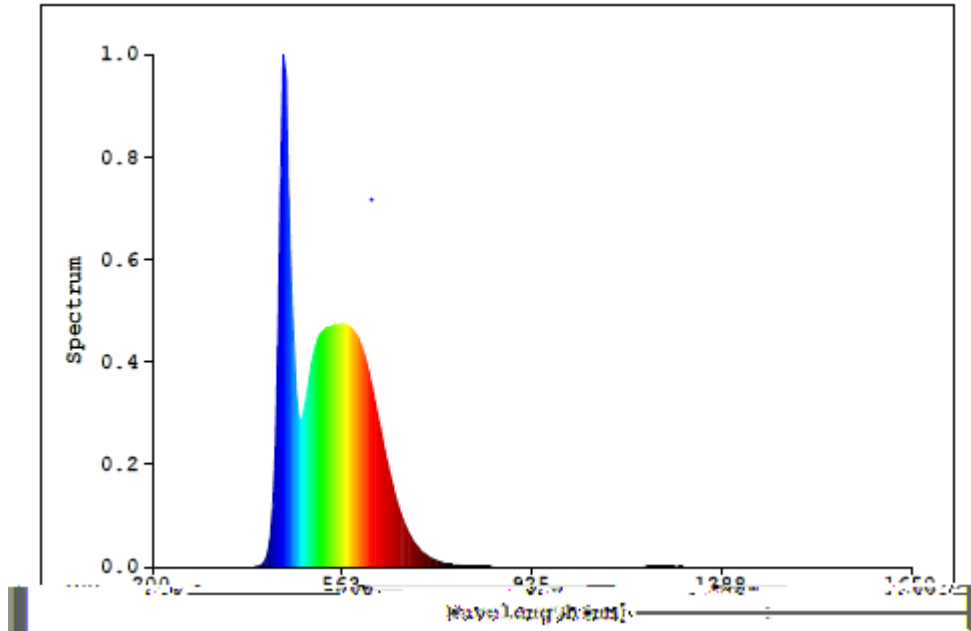
NOTE The action functions: see Table 4.1 and Table 4.2

The appliance aperture diameters: see 4.2.1

The limitations for the angular subtenses: see 4.2.2

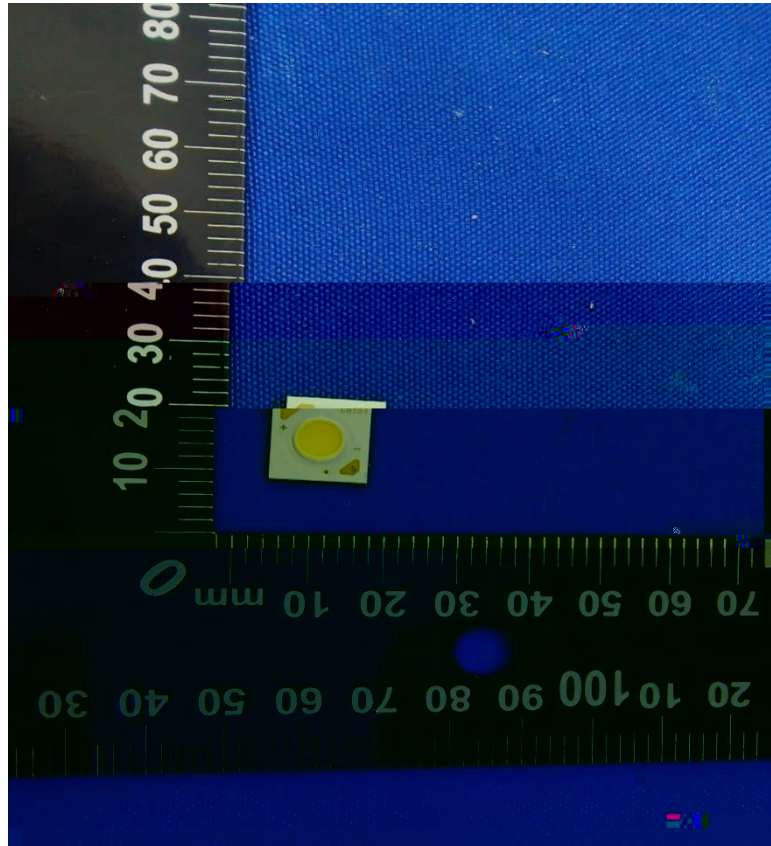
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5

Figure of Spectral distribution



Appendix A - EUT Photos

The overall view of EUT





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Directions

- 1.The information marked # is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.
- 2.Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
- 3.Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.
- 4.The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.
- 5.This report cannot be reproduced except in full, without prior written approval of the Company.