TEST REPORT

IEC 62471:2006

Photobic **afety of lamps and lamp systems**

Report reference No	170116550-03
Compiled by (+ signature)	ou Huang
Approved by (+ signature)	ison Huang
Date of issue	-01-18
Testing laboratory	Area Compliance Laboratories Corp. (Dongguan)
Address	9 Pulong Village,Puxinhu Industry Zone, Tangxia,Dongguan, a.
Testing location	e as above
Applicant	li Zhihui Group Co.,Ltd.
Address	, Xianke Yi Road, Huadong Town, Huadu District, Guangzhou, a
Standard	62471:2006
Test sample(s) received.....	-01-17
Test in period.....	-01-17
Procedure deviation	
Non-standard test method	

Note: This test report is for the c sto wn above and their specific product only. It may not be duplicated or used in part except i ut prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan).

Type of test object	
Trademark	
Model/type reference	-5730D34W-S1-08-HR3
Manufacturer.....	li Zhihui Group Co.,Ltd. , Xianke Yi Road, Huadong Town, Huadu District, Guangzhou China
Rating	: 2.8-3.4Vdc, 150mA

Copy of marking plate:
None

Test item particulars .....:

Tested lamp .....: LED
Tested lamp system .....: N.A.

Lamp classification group.....: Exempt Group
Lamp cap .....: N.A.
Bulb.....: N.A.
Rated of the lamp .....: N.A.
Furthermore marking on the lamp.....: N.A.
Seasoning of lamps according EN standard .....: No seasoning
Used measurement instrument.....: See appendix B for details
Temperature by measurement.....: 25.0°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 relates 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:
This report consists of 15 pages and following appendixes:
Appendix A EUT photos
Appendix B Test equipment list

General product information:
This product is a LED and manufactured by “Hongli Zhihui Group Co.,Ltd.”, Test model is HL-A-5730D34W-S1-08-HR3. Rated input is 2.8-3.4Vdc, 150mA.

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

IEC 62471:2006			
Clause	Requirement + Test	Result - Remark	Verdict
4.3.3	Retinal blue light hazard exposure limit		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(_), i.e., the blue-light weighted radiance , LB, shall not exceed the levels defined by:		P

IEC 62471:2006			
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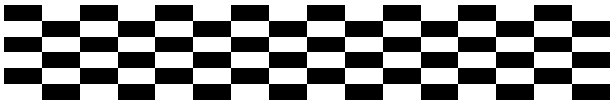
4.3.7	Infrared radiation hazard exposure limits for the eye		P
	The avoid thermal injury of the cornea and possible delayed effects upon the lens of the eye (cataractogenesis),ocular exposure to infrared radiation, EIR,over the wavelength range 780 nm to 3000 nm, for times less than 1000 s, shall not exceed:		N



IEC 62471:2006			
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	– the appropriate EN lamp standard, or		N

IEC 62471:2006			
Clause	Requirement + Test	Result - Remark	Verdict
	The calculation of source hazard values shall be performed by weighting the spectral scan by the appropriate function and calculating the total weighted energy.		P
5.3.3	Measurement uncertainty		P
	The quality of all measurement results must be quantified by an analysis of the uncertainty.		P
6	LAMP CLASSIFICATION		P
	For the purposes of this standard it was decided that the values shall be reported as follows:		P
	– for lamps intended for general lighting service, the hazard values shall be reported as either irradiance or radiance values at a distance which produces an illuminance of 500 lux, but not at a distance less than 200 mm		N
	– for all other light sources, including pulsed lamp sources, the hazard values shall be reported at a distance of 200 mm	At a distance of 200mm	P
6.1	Continuous wave lamps		P
6.1.1	Exempt Group		P
	In the except group are lamps, which does not pose any photobiological hazard. The requirement is met by any lamp that does not pose:		P
	– an actinic ultraviolet hazard (ES) within 8-hours exposure (30000 s), nor		P
	– a near-UV hazard (EUVA) within 1000 s, (about 16 min), nor		P
	– a retinal blue-light hazard (LB) within 10000 s (about 2,8 h), nor		P
	– a retinal thermal hazard (LR) within 10 s, nor		P
	– an infrared radiation hazard for the eye (EIR) within 1000 s		P
6.1.2	Risk Group 1 (Low-Risk)		N
	In this group are lamps, which exceeds the limits for the except group but that does not pose:		N
	– an actinic ultraviolet hazard (ES) within 10000 s, nor		N
	– a near ultraviolet hazard (EUVA) within 300 s, nor		N
	– a retinal blue-light hazard (LB) within 100 s, nor		N
	– a retinal thermal hazard (LR) within 10 s, nor		N
	– an infrared radiation hazard for the eye (EIR) within 100 s		N
	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.		N
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

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	– 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

IEC 62471:2006			
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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	$10^{[(450-\lambda)/50]}$	1.0
600-700	0.001	1.0
700-1050	0.013	$10^{[(700-\lambda)/500]}$
1050-1150	0.025	0.2
1150-1200	0.05	$0.2^{100.02(1150-\lambda)}$
1200-1400	0.10	0.02

* 1 Wavelengths chosen are representative: other values should be obtained by logarithmic interpolationat 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**	**Explosure aperture rad(deg)**	**Limiting aperture rad(deg)**	**EL in items of constant irradiance $W.m^{-2}$**
Actinic UV skin & eye	$E_S = \sum E_\lambda \bullet S(\lambda) \bullet \Delta\lambda$	200 – 400	< 30000	1.4 (80)	30/t
Eye UV-A	$E_{UVA} = \sum E_\lambda \bullet \Delta\lambda$	315 – 400	≤1000 >1000	1.4 (80)	10000/t 10
Blue-light small source	$E_B = \sum E_\lambda \bullet B(\lambda) \bullet \Delta\lambda$	300 – 700	≤100 >100	< 0.011	100/t 1,0
Eye IR	$E_{IR} = \sum E_\lambda \bullet \Delta\lambda$	780 –3000	≤1000 >1000	1.4 (80)	$18000/t^{0,75}$ 100
Skin thermal	$E_H = \sum E_\lambda \bullet \Delta\lambda$	380 – 3000	< 10	2π sr	$20000/t^{0,75}$

Table 5.5	Summary of the ELs for the retina (radiance based values)				-
Hazard Name	**Relevant equation**	**Wavelength Range nm**	**Explosure duration Sec**	**Field of view radians**	**EL in terms of constant radiance $W.m^{-2}.sr^{-1}$)**
Blue light	$L_B = \sum L_\lambda \bullet B(\lambda) \bullet \Delta\lambda$	300 – 700	0.25 – 10 10-100 100-10000 ≥ 10000	0.011•√(t/10) 0.011 0.0011•√t 0.1	$10^6/t$ $10^6/t$ $10^6/t$ 100
Retinal thermal	$L_R = \sum L_\lambda \bullet R(\lambda) \bullet \Delta\lambda$	380 – 1400	< 0,25 0.25 – 10	0,0017 0.011•√(t/10)	$50000/(\alpha \bullet t^{0,25})$ $50000/(\alpha \bullet t^{0,25})$
Retinal thermal (weak visual stimulus)	$L_{IR} = \sum L_\lambda \bullet R(\lambda) \bullet \Delta\lambda$	780 – 1400	> 10	0.011	6000/α

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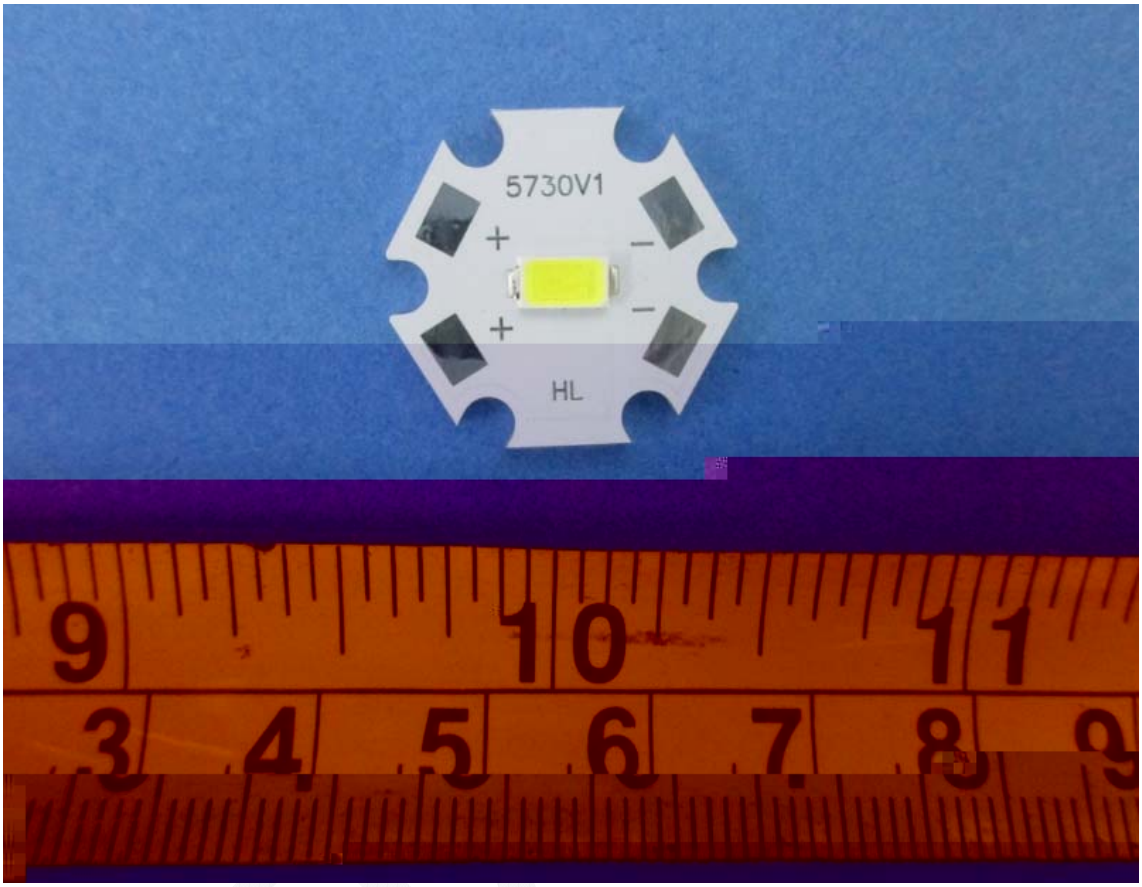
Table 6.1	Emission limits for risk groups of continuous wave lamps base on Directive(2006/25/EC)									P
Risk	Action spectrum	Units	Symbol	Exempt		Low risk		Mod risk		
				Limit	Result	Limit	Result	Limit	Result	
Actinic UV	Suv(λ)	$W.m^{-2}$	E_S	0.001	3.9×10^{-4}	0.003	--	0.03	--	
Near UV		$W.m^{-2}$	E_{UVA}	10	2.7×10^{-4}	33	--	100	--	
Blue light	B(λ)	$W.m^{-2}.sr^{-1}$	L_B	100	78.4	10000	--	4000000	--	
Blue light,small source	B(λ)	$W.m^{-2}$	E_B	1	0.45	1	--	400	--	
Retinal thermal	R(λ)	$W.m^{-2}.sr^{-1}$	L_R	28000/ α (α =0.0035)	4.8×10^{4}	28000/ α (α =0.0035)	--	71000/ α (α =0.0035)	--	
Retinal thermal, Weak visual stimulus**	R(λ)	$W.m^{-2}.sr^{-1}$	L_{IR}	6000/ α (α =0.0035)	39	6000/ α (α =0.0035)	--	28000/ α (α =0.0035)	--	
IR radiation Eye		$W.m^{-2}$	E_{IR}	100	0	570	--	3200	--	

* Small source defined as one with α < 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 applicance apertuer 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

Appendix A –EUT Photos

The overall view of EUT



Appendix B –Test equipment list

Equipment Description	Model No	BACL#	Manufacturer	Last Cal	Cal Due
UV-VIS-near IR Spectrophotocolorimeter	PMS-2000	T-08-SF213	EVERFINE	2016-08-08	2017-08-08
Imaging luminance meter	CX-2K	T-08-SF140-1	EVERFINE	2016-08-08	2018-08-08
Radiation illuminance meter	RD-2000	T-08-SF140-2	EVERFINE	2016-08-08	2018-08-08
Radiation illuminance meter	RD-2000	T-08-SF140-3	EVERFINE	2016-08-08	2018-08-08
High Accuracy Array	HAAS-2000	T-08-SF140-4	EVERFINE	2016-08-08	2018-08-08
Hygrothermograph	PWS280	T-08-QA026	N/A	2016-03-21	2017-03-21
Standard power spectral UV radiation-specific	UVS-8003	T-08-EE048	EVERFINE	2016-03-21	2017-03-21
80mm sample integrating sphere	SMS-300	F-08-SF130	EVERFINE	2016-12-25	2018-12-24
Steel tape	HILOCK-19	T-08-SF100	TAJIMA	2013-4-18	2018-4-17

***** End of report *****