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Photobiological Safety of Lamps and Lamp Systems


Standard Used :	IEC 62471: 2006 (First Edition)/EN 62471:2008, Approved Method: Photobiological safety of lamps and lamp systems
Date of Test :	July 5, 2016
Date of Issue :	July 7, 2016
Report Number :	GO16062402



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TEST REPORT	
IEC 62471: 2006 (First Edition)/EN 62471:2008 Photobiological Safety of Lamps and Lamp Systems	
Report Number	: GO16062402
Date of issue	: July 7, 2016
Total number of pages	: 20
Tested by (printed name and signature).....	: Alex Sung Alex Sung
Reported by (printed name and signature).....	: Alex Sung Alex Sung
Approved by (printed name and signature).....	: David Yuan David Yuan
Testing Laboratory	: Great One Global Certification Co., Ltd.
Address	: 9F-2, No. 120, Qiaohe Rd., Zhonghe Dist., New Taipei City 235, Taiwan (R.O.C.)
Applicant's name	: CAME-TV Limited
Address	: 802 Unit, A03 Building, NO.339 Chengyi Street, Software Park Phase III, Jimei District, 361021, Xiamen City, Fujian, China
Manufacturer's name	: CAME-TV Limited
Address	: 802 Unit, A03 Building, NO.339 Chengyi Street, Software Park Phase III, Jimei District, 361021, Xiamen City, Fujian, China
Test item description	:
Product Name	: 500W LED COB
Trade Mark	: 
Model/Type reference	: LTCX1726-500-001-3000k LTCX1726-500-001-5200k
Rating	: 52.7 Vdc, 4450 mA * 2 (Dual input)

1. The test results of this report relate only to the tested sample identified in this report.
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3. The data in report cannot be used for advertisement, publication and promotion.



Summary of testing:

Tests performed (name of test and test clause):

The test samples were configured for continuous emission and dual input powered by 4450 mA constant current.

The LED output power was measured under normal conditions noted in details of measurement procedure and measurement results.

Measurement results:

LTCX1726-500-001-3000k : See page 15

LTCX1726-500-001-5200k : See page 16

The model complied with the requirements of Risk Group 1 LED Product according to IEC 62471: 2006 (First Edition)/EN 62471:2008.

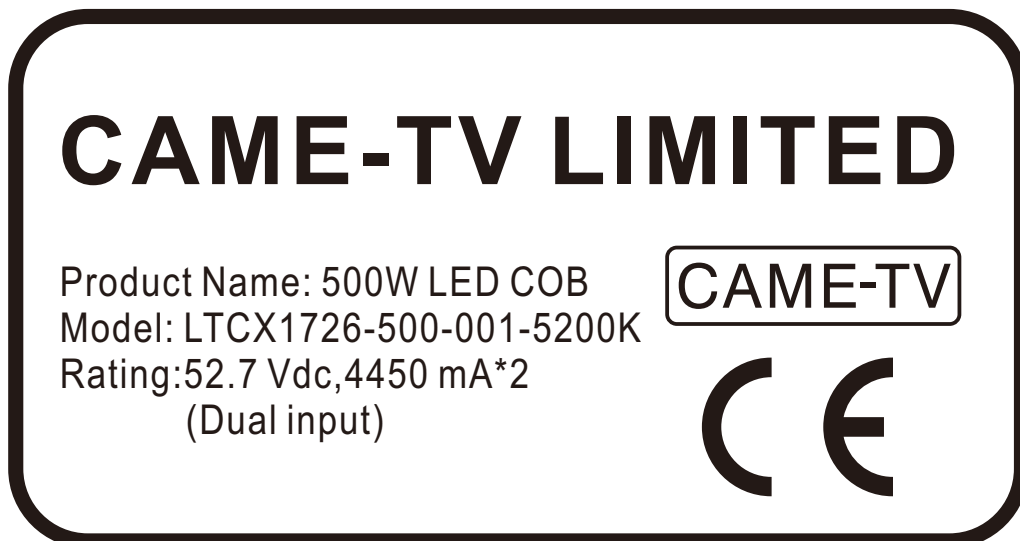
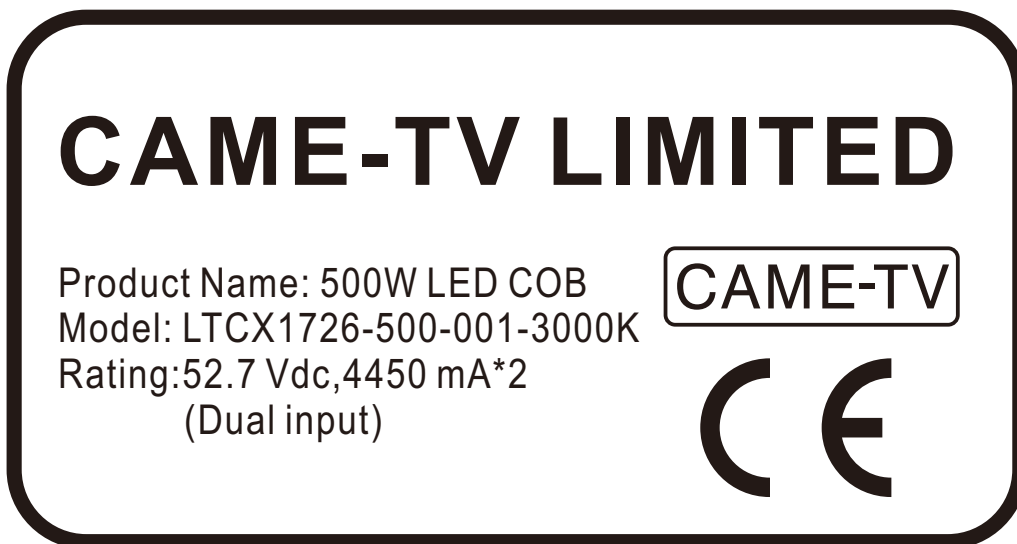
Testing location:

Great One Global Certification Co., Ltd.

Address:

9F-2, No. 120, Qiaohe Rd., Zhonghe Dist., New Taipei City 235, Taiwan (R.O.C.)

Copy of marking plate (Example):





Test item particulars.....:

Tested lamp : continuous wave lamps pulsed lamps

Tested lamp system : LED

Lamp classification group : exempt risk 1 risk 2 risk 3

Lamp cap : N/A

Bulb..... : N/A

Rated of the lamp : 52.7 Vdc, 4450 mA * 2 (Dual input)

Furthermore marking on the lamp : N/A

Seasoning of lamps according IEC standard : IEC 62471: 2006 (First Edition)

Used measurement instrument : OST-300

Temperature by measurement : 25.5 °C

Information for safety use : Risk Group 1

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..... : July 4, 2016

Date (s) of performance of tests : July 5, 2016

General remarks:

The test results presented in this report relate only to the object tested.
 This report shall not be reproduced Exempt 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 comma (point) is used as the decimal separator.
 List of test equipment must be kept on file and available for review.

General product information:

The products complied with the requirements of Risk Group 1 LED Product according to IEC 62471: 2006 (First Edition)/EN 62471:2008

Description of model series:

Model Name	Size	Typ. Watt
LTAX1202-012-002	13.5*13.5 mm	12 W
LTAX1202-012-007	15.85*15.85 mm	12 W
LTBX1204-035-002	19*19 mm	35 W
LTBX1010-050-012	28*28 mm	50 W
LTBX1010-050-026	23.85*23.85 mm	50 W
LTCX1020-100-013	38*38 mm	100 W
LTCX1722-200-005	42*46 mm	200 W
LTCX1725-200-008	54*54 mm	200 W
LTCX1726-500-001	65*65 mm	500 W



IEC 62471: 2006 (FIRST EDITION)/EN 62471:2008			
Clause	Requirement + Test	Result – Remark	Verdict
4	EXPOSURE LIMITS		P
4.1	General		P
	The exposure limits in this standard is not less than 0,01 ms and not more than any 8hour period and should be used as guides in the control of exposure		P
	Detailed spectral data of a light source are generally required only if the luminanceof the source exceeds $10^4 \text{ cd}\cdot\text{m}^{-2}$	See Clause 4.3	P
4.3	Hazard exposure limits		P
4.3.1	Actinic UV hazard exposure limit for the skin and eyes	See Table 6.1	P
	The exposure limit for effective radiant exposure is $30 \text{ J}\cdot\text{m}^{-2}$ within any 8-hour period	See Table 4.1	P
	To protect against injury of the eye or skin from ultraviolet radiation exposure produced by a broad-band source, the effective integrated spectral irradiance , E_s , of the light source shall not exceed the levels defined by: $E_s \cdot t = \sum_{200}^{400} \sum_t E_\lambda(\lambda, t) \cdot S_{UV}(\lambda) \cdot \Delta t \cdot \Delta \lambda \leq 30 \quad \text{J}\cdot\text{m}^{-2}$	See Table 5.4	P
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye or skin shall be computed by: $t_{\max} = \frac{30}{E_s} \quad \text{s}$	See Table 5.4	P
4.3.2	Near-UV hazard exposure limit for eye		P
	For the spectral region 315 nm to 400 nm (UVA) the total radiant exposure to the eye shall not exceed $10000 \text{ J}\cdot\text{m}^{-2}$ for exposure times less than 1000 s. For exposure times greater than 1000 s (approximately 16 minutes) the UV-A irradiance for the unprotected eye, E_{UVA} , shall not exceed $10 \text{ W}\cdot\text{m}^{-2}$.	See Table 4.1	P
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye for time less than 1000 s, shall be computed by: $t_{\max} \leq \frac{10\,000}{E_{UVA}} \quad \text{s}$	See Table 5.4	P
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, $B(\lambda)$, i.e., the bluelight weighted radiance , L_B , shall not exceed the levels defined by:	See Table 4.2	P



IEC 62471: 2006 (FIRST EDITION)/EN 62471:2008			
Clause	Requirement + Test	Result – Remark	Verdict
	$L_B \cdot t = \sum_{300}^{700} \sum_t L_\lambda(\lambda, t) \cdot B(\lambda) \cdot \Delta\lambda \leq 10^6 \quad \text{J} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	for $t \leq 10^4 \text{ s}$ $t_{\max} = \frac{10^6}{L_B}$	P
	$L_B = \sum_{300}^{700} L_\lambda \cdot B(\lambda) \cdot \Delta\lambda \leq 100 \quad \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	for $t > 10^4 \text{ s}$	P
4.3.4	Retinal blue light hazard exposure limit- small source		N/A
	Thus the spectral irradiance at the eye E_λ , weighted against the blue-light hazard function $B(\lambda)$ shall not exceed the levels defined by:	see table 4.2	N/A
	$E_B \cdot t = \sum_{300}^{700} \sum_t E_\lambda(\lambda, t) \cdot B(\lambda) \cdot \Delta\lambda \leq 100 \quad \text{J} \cdot \text{m}^{-2}$	for $t \leq 100 \text{ s}$	N/A
	$E_B = \sum_{300}^{700} E_\lambda \cdot B(\lambda) \cdot \Delta\lambda \leq 1 \quad \text{W} \cdot \text{m}^{-2}$	for $t > 100 \text{ s}$	N/A
4.3.5	Retinal thermal hazard exposure limit		P
	To protect against retinal thermal injury, the integrated spectral radiance of the light source, L_λ , weighted by the burn hazard weighting function $R(\lambda)$ (from Figure 4.2 and Table 4.2), i.e., the burn hazard weighted radiance, shall not exceed the levels defined by:	($10 \mu\text{s} \leq t \leq 10 \text{ s}$)	P
	$L_R = \sum_{380}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{50\,000}{\alpha \cdot t^{0,25}} \quad \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$		
4.3.6	Retinal thermal hazard exposure limit– weak visual stimulus		N/A
	For an infrared heat lamp or any nearinfrared source where a weak visual stimulus is inadequate to activate the aversion response, the near infrared (780 nm to 1400 nm) radiance, L_{IR} , as viewed by the eye for exposure times greater than 10 s shall be limited to:	$t > 10 \text{ s}$	N/A
	$L_{IR} = \sum_{780}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{6\,000}{\alpha} \quad \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$		
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, E_{IR} , over the wavelength range 780 nm to 3000 nm, for times less than 1000 s, shall not exceed:	$t \leq 1000 \text{ s}$	P
	$E_{IR} = \sum_{780}^{3000} E_\lambda \cdot \Delta\lambda \leq 18\,000 \cdot t^{-0,75} \quad \text{W} \cdot \text{m}^{-2}$		



IEC 62471: 2006 (FIRST EDITION)/EN 62471:2008			
Clause	Requirement + Test	Result – Remark	Verdict

	For times greater than 1000 s the limit becomes: $E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta\lambda \leq 100 \quad W \cdot m^{-2}$	t > 1000 s	P
4.3.8	Thermal hazard exposure limit for the skin		P
	Visible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be limited to: $E_{H \cdot t} = \sum_{380}^{3000} \sum_t E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta\lambda \leq 20\,000 \cdot t^{0,25} \quad J \cdot m^{-2}$	See Table 5.4	P

5	MEASUREMENT OF LAMPS AND LAMP SYSTEMS		P
5.1	Measurement conditions		P
	Measurement conditions shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.		P
5.1.1	Lamp ageing (seasoning)		P
	Seasoning of lamps shall be done as stated in the appropriate IEC lamp standard.		P
5.1.2	Test environment		P
	For specific test conditions, see the appropriate IEC lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.		P
5.1.3	Extraneous radiation		P
	Careful checks should be made to ensure that extraneous sources of radiation and reflections do not add significantly to the measurement results.		P
5.1.4	Lamp operation		P
	Operation of the test lamp shall be provided in accordance with:		P
	the appropriate IEC lamp standard, or		N/A
	the manufacturer's recommendation		P
5.1.5	Lamp system operation		P
	The power source for operation of the test lamp shall be provided in accordance with:		P
	the appropriate IEC standard, or		N/A
	the manufacturer's recommendation		P
5.2	Measurement procedure		P
5.2.1	Irradiance measurements		P
	Minimum aperture diameter 7mm.		P



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Clause	Requirement + Test	Result – Remark	Verdict
	Maximum aperture diameter 50 mm.		P
	The measurement shall be made in that position of the beam giving the maximum reading.		P
	The measurement instrument is adequate calibrated.		P
5.2.2	Radiance measurements		P
5.2.2.1	Standard method		P
	The measurements made with an optical system.		P
	The instrument shall be calibrated to read in absolute radiant power per unit receiving area and per unit solid angle to acceptance averaged over the field of view of the instrument.		P
5.2.2.2	Alternative method		N/A
	Alternatively to an imaging radiance setup, an irradiance measurement setup with a circular field stop placed at the source can be used to perform radiance measurements.		N/A
5.2.3	Measurement of source size		P
	The determination of α , the angle subtended by a source, requires the determination of the 50% emission points of the source.		P
5.2.4	Pulse width measurement for pulsed sources		N/A
	The determination of Δt , the nominal pulse duration of a source, requires the determination of the time during which the emission is > 50% of its peak value.		N/A
5.3	Analysis methods		P
5.3.1	Weighting curve interpolations		P
	To standardize interpolated values, use linear interpolation on the log of given values to obtain intermediate points at the wavelength intervals desired.	see table 4.1	P
5.3.2	Calculations		P
	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:	see table 6.1	P



IEC 62471: 2006 (FIRST EDITION)/EN 62471:2008			
Clause	Requirement + Test	Result – Remark	Verdict
	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/A
	for all other light sources, including pulsed lamp sources, the hazard values shall be reported at a distance of 200 mm		P
6.1	Continuous wave lamps		P
6.1.1	Exempt Group		N/A
	In the Exempt group are lamps, which does not pose any photobiological hazard. The requirement is met by any lamp that does not pose:	See table 6.1	N/A
	an actinic ultraviolet hazard (E_B) within 8-hours exposure (30000 s), nor		N/A
	a near-UV hazard (E_{UVA}) within 1000 s, (about 16 min), nor		N/A
	a retinal blue-light hazard (L_B) within 10000 s (about 2,8 h), nor		N/A
	a retinal thermal hazard (L_R) within 10 s, nor		N/A
	an infrared radiation hazard for the eye (E_{IR}) within 1000 s		N/A
6.1.2	Risk Group 1 (Low-Risk)		P
	In this group are lamps, which exceeds the limits for the Exempt group but that does not pose:		P
	an actinic ultraviolet hazard (E_B) within 10000 s, nor		P
	a near ultraviolet hazard (E_{UVA}) within 300 s, nor		P
	a retinal blue-light hazard (L_B) within 100 s, nor		P
	a retinal thermal hazard (L_R) within 10 s, nor		P
	an infrared radiation hazard for the eye (E_{IR}) within 100 s		P
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a nearinfrared retinal hazard (L_{IR}), within 100 s are in Risk Group 1.		P
6.1.3	Risk Group 2 (Moderate-Risk)		N/A
	This requirement is met by any lamp that exceeds the limits for Risk Group 1, but that does not pose:		N/A
	an actinic ultraviolet hazard (E_B) within 1000 s exposure, nor		N/A
	a near ultraviolet hazard (E_{UVA}) within 100 s, nor		N/A
	a retinal blue-light hazard (L_B) within 0,25 s (aversion response), nor		N/A



IEC 62471: 2006 (FIRST EDITION)/EN 62471:2008			
Clause	Requirement + Test	Result – Remark	Verdict
	a retinal thermal hazard (L_R) within 0,25 s (aversion response), nor		N/A
	an infrared radiation hazard for the eye (E_{IR}) within 10 s		N/A
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a nearinfrared retinal hazard (L_R), within 10 s are in Risk Group 2.		N/A
6.1.4	Risk Group 3 (High-Risk)		N/A
	Lamps which exceed the limits for Risk Group 2 are in Group 3.		N/A
6.2	Pulsed lamps		N/A
	Pulse lamp criteria shall apply to a single pulse and to any group of pulses within 0,25 s.		N/A
	A pulsed lamp shall be evaluated at the highest nominal energy loading as specified by the manufacturer.		N/A
	The risk group determination of the lamp being tested shall be made as follows:		N/A
	a lamp that exceeds the exposure limit shall be classified as belonging to Risk Group 3 (HighRisk)		N/A
	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/A
	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/A



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Clause	Requirement + Test	Result – Remark	Verdict
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Table 4.1		Spectral weighting function for assessing ultraviolet hazards for skin and eye		INFO
Wavelength ¹ λ, nm	UV hazard function S _{uv} (λ)	Wavelength λ, nm	UV hazard function S _{uv} (λ)	
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	
285	0,770	360	0,00013	
290	0,640	365*	0,00011	
295	0,540	370	0,000093	
297*	0,460	375	0,000077	
300	0,300	380	0,000064	
303*	0,120	385	0,000053	
305	0,060	390	0,000044	
308	0,026	395	0,000036	
310	0,015	400	0,000030	

¹ Wavelengths chosen are representative: other values should be obtained by logarithmic interpolation at intermediate wavelengths.
* Emission lines of a mercury discharge spectrum.



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Clause	Requirement + Test	Result – Remark	Verdict
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Table 4.2		Spectral weighting functions for assessing retinal hazards from broadband optical sources		INFO
Wavelength nm	Blue-light hazard function B (λ)	Burn hazard function R (λ)		
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		



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Clause	Requirement + Test	Result – Remark	Verdict
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Table 4.2	Spectral weighting functions for assessing retinal hazards from broadband optical sources		INFO
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		$10^{[(700-\lambda)/500]}$	
1050-1150		0,2	
1150-1200		$0,2 \cdot 10^{0,02(1150-\lambda)}$	
1200-1400		0,02	



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Clause	Requirement + Test	Result – Remark	Verdict
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Table 5.4		Summary of the ELs for the surface of the skin or cornea (irradiance based values)				INFO
Hazard Name	Relevant equation	Wavelength range nm	Exposure duration sec	Limiting aperture rad (deg)	EL in terms of constant irradiance $W \cdot m^{-2}$	
Actinic UV skin & eye	$E_S = \sum E_\lambda \cdot S(\lambda) \cdot \Delta\lambda$	200 – 400	< 30000	1,4 (80)	30/t	
Eye UV-A	$E_{UVA} = \sum E_\lambda \cdot \Delta\lambda$	315 – 400	≤ 1000 >1000	1,4 (80)	10000/t 10	
Blue-light small source	$E_B = \sum E_\lambda \cdot B(\lambda) \cdot \Delta\lambda$	300 – 700	≤ 100 >100	< 0,011	100/t 1,0	
Eye IR	$E_{IR} = \sum E_\lambda \cdot \Delta\lambda$	780 – 3000	≤ 1000 >1000	1,4 (80)	18000/t ^{0,75} 100	
Skin thermal	$E_H = \sum E_\lambda \cdot \Delta\lambda$	380 – 3000	< 10	2π sr	20000/t ^{0,75}	

Table 5.5		Summary of the ELs for the retina (radiance based values)				INFO
Hazard Name	Relevant equation	Wavelength range nm	Exposure duration sec	Field of view radians	EL in terms of constant radiance $W \cdot m^{-2} \cdot sr^{-1}$	
Blue light	$L_B = \sum L_\lambda \cdot B(\lambda) \cdot \Delta\lambda$	300 – 700	0,25 – 10	0,011•√(t/10)	10 ⁶ /t	
			10-100	0,011	10 ⁶ /t	
			100-10000	0,0011•√t	10 ⁶ /t	
			≥ 10000	0,1	100	
Retinal thermal	$L_R = \sum L_\lambda \cdot R(\lambda) \cdot \Delta\lambda$	380 – 1400	< 0,25	0,0017	50000/(α•t ^{0,25})	
			0,25 – 10	0,011•√(t/10)	50000/(α•t ^{0,25})	
Retinal thermal (weak visual stimulus)	$L_{IR} = \sum L_\lambda \cdot R(\lambda) \cdot \Delta\lambda$	780 – 1400	> 10	0,011	6000/α	



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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
Model		LTCX1726-500-001-3000k								
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	-	0,003	$1.1e-05$	0,03	-	
Near UV		E_{UVA}	$W \cdot m^{-2}$	10	-	33	$1.8e-04$	100	-	
Blue light	$B(\lambda)$	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	-	10000	$1.2e+03$	4000000	-	
Blue light, small source	$B(\lambda)$	E_B	$W \cdot m^{-2}$	1,0*	-	1,0	-	400	-	
Retinal thermal	$R(\lambda)$	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	$28000/\alpha$	-	$28000/\alpha$	$2.2e+04$	$71000/\alpha$	-	
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	-	570	$5.1e-01$	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



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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
Model		LTCX1726-500-001-5200k								
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	-	0,003	1.2e-05	0,03	-	
Near UV		E_{UVA}	$W \cdot m^{-2}$	10	-	33	4.2e-01	100	-	
Blue light	$B(\lambda)$	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	-	10000	3.0e+03	4000000	-	
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	-	28000/ α	3.9e+04	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	-	570	4.4e-01	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

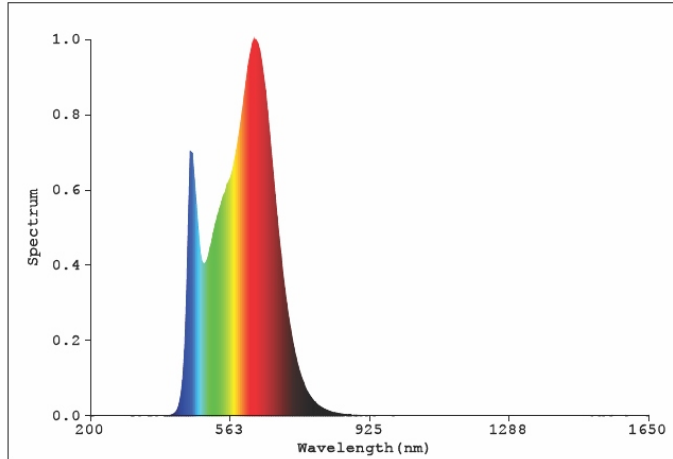


Radiation Photobiological Safety Report

Model : LTCX1726-500-001-3000K
 Number : 16062402-1
 Manufacturer: Lighten Corp.
 Tester : Alex Sung
 Date : 2016-07-05

Instrument : OST-300(EVERFINE)
 Temperature : 25.5deg
 RH : 60.0%
 Remarks : 50.31 Vdc,4.450 A;46.71 Vdc,4.450 A

B(L) & R(L)



LB RFOV (mrad)	Measured (W/m2/sr)	Limit (W/m2/sr)
100(Exempt Risk Group)	3.5e+02	1.0e+02
11(Risk Group 1)	1.2e+03	1.0e+04
1.7(Risk Group 2)	1.2e+03	4.0e+06
LR RFOV (mrad)	Measured (W/m2/sr)	Limit (W/m2/sr)
11(Exempt Risk Group)	2.2e+04	2.1e+06
11(Risk Group 1)	2.2e+04	2.1e+06
1.7(Risk Group 2)	2.2e+04	5.4e+06

Color Parameters:

Chromaticity Coordinate:x=0.4188 y=0.3831/u'=0.2478 v'=0.5101 Tc=3152K

Dominant WL:Ld=584.8nm Peak WL:Lp=625.0nm Purity=40.7% Red Ratio:R=26.6%

Render Index:Ra=91.7 FWHM=169.0nm

R1 =94 R2 =91 R3 =92 R4 =95 R5 =92 R6 =86 R7 =90

R8 =93 R9 =97 R10=83 R11=97 R12=73 R13=92 R14=97 R15=95

Photo Parameters(CX Condition:Single Test, IP = 16261):

Distance = 4365.2mm

Alpha = 0.0131rad

E = 500.0lx

Es = 1.1e-05W/m2 Tmax_Es > 8h

Eb = 2.0e-01 W/m2 Tmax is not needed

Euva = 1.8e-04 W/m2 Tmax_Euva > 1000s

Eir = 5.1e-01 W/m2 Tmax_Eir > 1000s

Eh = 2.4e+00 W/m2 Tmax_Eh < 165727s

LB = 1.2e+03 W/m2/Sr Tmax_LB < 818s

LR = 2.2e+04 W/m2/Sr Tmax_LR > 10s

Lir = 5.6e+01 W/m2/Sr (Tmax is not needed)

Result:

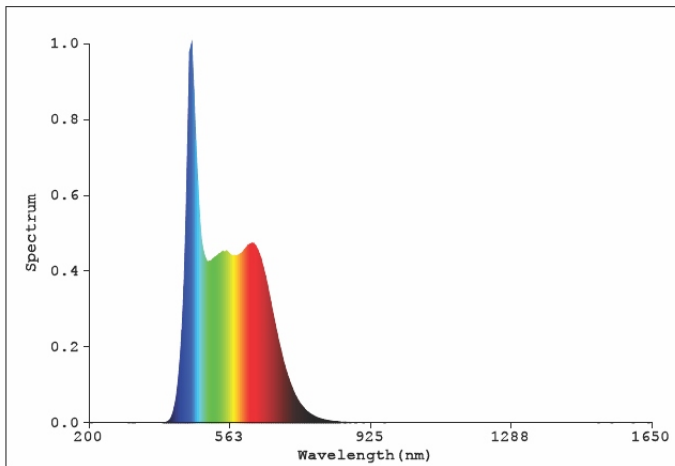
Lamp Type: Risk Group 1



Radiation Photobiological Safety Report

Model : LTCX1726-500-001-5200K
Number : 16062402-2
Manufacturer: Lighten Corp.
Tester : Alex Sung
Date : 2016-07-05

Instrument : OST-300(EVERFINE)
Temperature : 25.5deg
RH : 60.0%
Remarks : 50.33 Vdc,4.450 A;44.71 Vdc,4.450 A



B(L) & R(L)

LB RFOV (mrad)	Measured (W/m2/sr)	Limit (W/m2/sr)
100(Exempt Risk Group)	8.2e+02	1.0e+02
11(Risk Group 1)	3.0e+03	1.0e+04
1.7(Risk Group 2)	3.1e+03	4.0e+06
LR RFOV (mrad)	Measured (W/m2/sr)	Limit (W/m2/sr)
11(Exempt Risk Group)	3.9e+04	2.5e+06
11(Risk Group 1)	3.9e+04	2.5e+06
1.7(Risk Group 2)	3.9e+04	6.4e+06

Color Parameters:

Chromaticity Coordinate:x=0.3212 y=0.3237/u'=0.2058 v'=0.4667 Tc=6078K

Dominant WL:Ld=480.6nm Peak WL:Lp=465.0nm Purity=5.0% Red Ratio:R=18.8%

Render Index:Ra=87.1 FWHM=42.5nm

R1 =88 R2 =87 R3 =89 R4 =86 R5 =88 R6 =85 R7 =85
R8 =88 R9 =74 R10=75 R11=90 R12=72 R13=87 R14=95 R15=86

Photo Parameters(CX Condition:Single Test, IP = 25358):

Distance = 4912.0mm

Alpha = 0.0111rad

E = 500.0lx

Es = 1.2e-05W/m2 Tmax_Es > 8h

Eb = 4.2e-01 W/m2 Tmax is not needed

Euva = 4.2e-04 W/m2 Tmax_Euva > 1000s

Eir = 4.4e-01 W/m2 Tmax_Eir > 1000s

Eh = 2.4e+00 W/m2 Tmax_Eh < 169689s

LB = 3.0e+03 W/m2/Sr Tmax_LB < 328s

LR = 3.9e+04 W/m2/Sr Tmax_LR > 10s

Lir = 4.2e+01 W/m2/Sr (Tmax is not needed)

Result:

Lamp Type: Risk Group 1

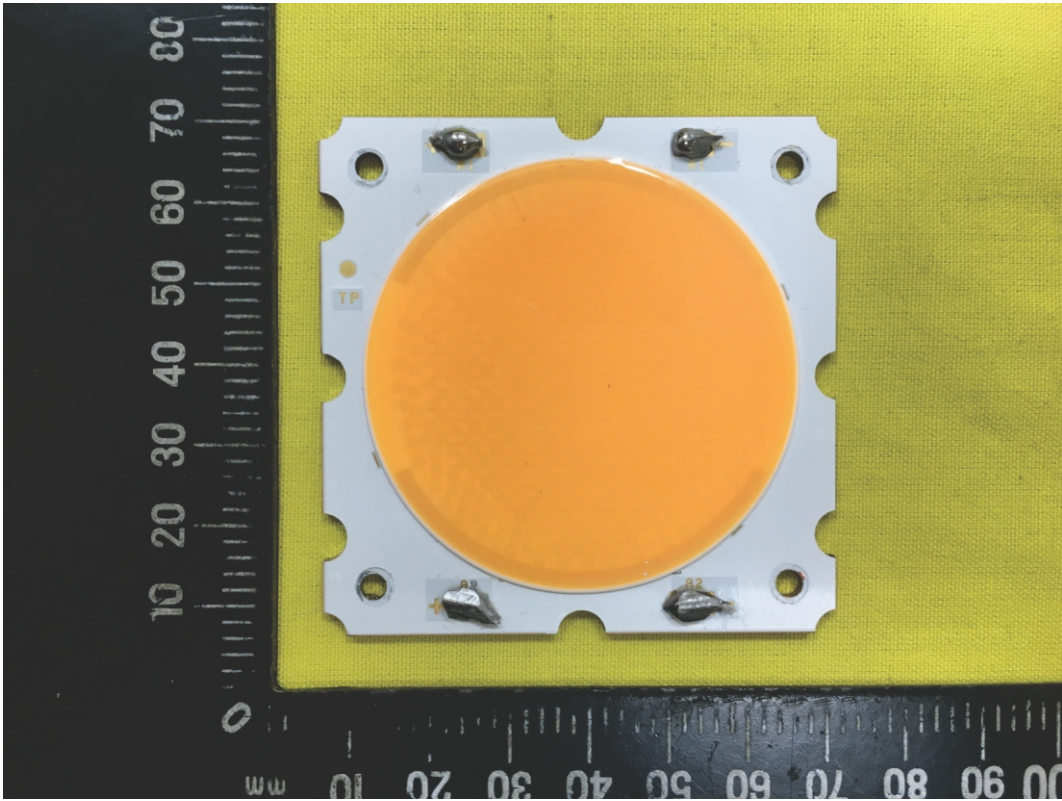


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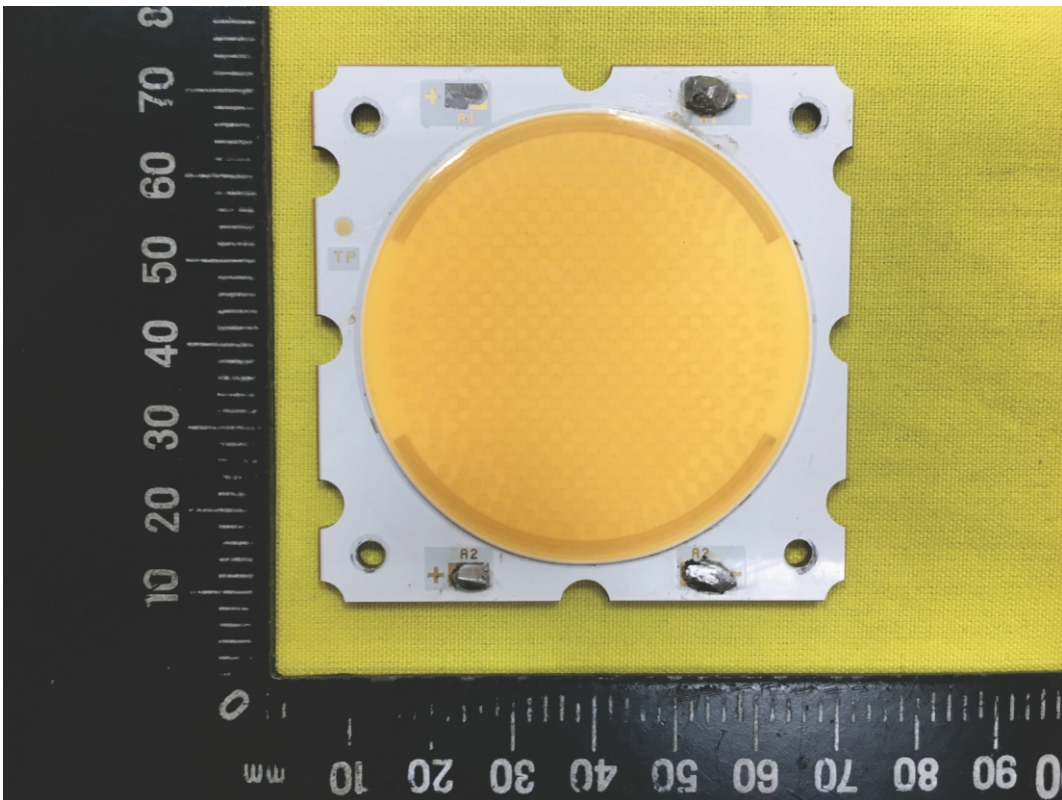
Appendix A

Photo

Model : LTCX1726-500-001-3000k



Model : LTCX1726-500-001-5200k



~ End of Report ~



TEST REPORT	
IEC 62471: 2006 (First Edition)/EN 62471:2008	
光源及光源系統之光生物安全性	
測試報告	
報告編號 :	GO16062402
發行日期 :	2016-07-07
報告總頁數 :	20
測試人員 (簽章)..... :	Alex Sung Alex Sung
報告製作人員 (簽章)..... :	Alex Sung Alex Sung
報告簽署人員 (簽章)..... :	David Yuan David Yuan
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地址 :	新北市中和區橋和路120號9樓之二
委託廠商名稱 :	廈門凱夢攝影器材有限公司
地址 :	中國福建省廈門市集美區軟件園三期誠毅大街339號A03棟802室
試驗規範標準 :	IEC 62471: 2006 (First Edition)/EN 62471:2008
測試樣品 :	
樣品名稱 :	500W LED COB
品牌 :	CAME-TV
樣品型號 :	LTCX1726-500-001-3000k LTCX1726-500-001-5200k
樣品額定值 :	52.7 Vdc, 4450 mA * 2 (Dual input)
測試總結:	
產品標籤:	
 Product Name: 500W LED COB Model: LTCX1726-500-001-3000K Rating: 52.7 Vdc, 4450 mA*2 (Dual input)	 Product Name: 500W LED COB Model: LTCX1726-500-001-5200K Rating: 52.7 Vdc, 4450 mA*2 (Dual input)



Appendix A

測試樣品名稱.....:500W LED COB
 光源測試值:52.7 Vdc, 4450 mA * 2 (Dual input)
 判定結果.....: 無風險類別 風險 1 風險 2 風險 3
 使用儀器.....:OST-300
 測試件數.....:2
 燈具枯化點燈參考規範.....: IEC 62471 (2006年版)
 使用儀器.....:OST-300
 測試環境溫度.....: 25.5 °C

測試狀態判定:

- 測試項目不適用.....:不適用
- 測試樣品符合要求.....:符合
- 測試樣品不符合要求.....:不符合

測試:

收件日期.....:2016-07-04
 測試日期.....:2016-07-05
 結果.....:風險類別1(低度風險)

一般需知:

本報告僅對測試樣品負責，未經本實驗室書面許可不得部分摘錄複製。
 本報告格式是乃依據 IEC62471 個別標準節錄製作，詳細內容請參閱標準。

測試樣品系列描述:

Model Name	Size	Typ. Watt
LTAX1202-012-002	13.5*13.5 mm	12 W
LTAX1202-012-007	15.85*15.85 mm	12 W
LTBX1204-035-002	19*19 mm	35 W
LTBX1010-050-012	28*28 mm	50 W
LTBX1010-050-026	23.85*23.85 mm	50 W
LTCX1020-100-013	38*38 mm	100 W
LTCX1722-200-005	42*46 mm	200 W
LTCX1725-200-008	54*54 mm	200 W
LTCX1726-500-001	65*65 mm	500 W