



TEST REPORT IEC 62471:2006 First edition / EN 62471:2008 Photobiological safety of lamps and lamp systems	
Report Reference No.	OC-2013-B0036
Date of issue	Nov. 26, 2013
Testing Laboratory	SGS Taiwan Ltd., Optics Laboratory
Address	No. 33, Wu Chyuan Road, New Taipei Industrial Park, Wu Ku District, New Taipei City 24886, Taiwan (R.O.C.)
Applicant's name	EVERLIGHT ELECTRONICS CO., LTD.
Address	No. 6-8, Zhonghua Rd., Shulin Dist., New Taipei City, Taiwan 23860
Test specification:	
Standard	IEC 62471:2006 First edition / EN 62471:2008 Photobiological safety of lamps and lamp systems
Test procedure	For Europe CE Marking Testing Only
Non-standard test method	N/A
Test item description	SMD C Type
Trade Mark	EVERLIGHT[®]
Manufacturer	EVERLIGHT ELECTRONICS CO., LTD.
Model/Type reference	67-21S SMD LED (2835 Package), 3000K, 67-21S SMD LED (2835 Package), 5700K
Ratings	DC 60 mA, 0.2 W
Conclusion:	In the opinion of SGS, the submitted <u>Device Under Test</u> (DUT) complies with <u>Exempt Group</u> of the above test specification.
Tested by: Willie Yu Sr. Engineer Nov. 26, 2013	Approved by: Calvin Tzou Technical Manager Nov. 26, 2013
 _____ Signature	 _____ Signature
<p>Details and test results are given in subsequent pages of this report. This report refers only to the unit(s) submitted for test. "(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. This document is issued by the Company subject to its General Conditions of Service printed overleaf, available on request or accessible at www.sgs.com/terms_and_conditions.htm and, for electronic format documents, subject to Terms and Conditions for Electronic Documents at http://www.sgs.com/terms_e-document.htm Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein. Any holder of this document is advised that information contained hereon reflects the Company's findings at the time of its intervention only and within the limits of Client's instructions, if any. The Company's sole responsibility is to its Client and this document does not exonerate parties to a transaction from exercising all their rights and obligations under the transaction documents. This document cannot be reproduced except in full, without prior written approval of the Company. Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested and such sample(s) are retained for 30 days only.</p>	

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<p><input checked="" type="checkbox"/> Testing Laboratory:</p> <p>Testing Location / Address.....:</p>	<p>SGS Taiwan Ltd., Optics Laboratory</p> <p>No. 55, Wu Chyuan Road, New Taipei Industrial Park, Wu Ku District, New Taipei City 24886, Taiwan (R.O.C.)</p>																									
<p>Main Test Equipment:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: center;">Name</th> <th style="text-align: center;">Brand</th> <th style="text-align: center;">Model</th> <th style="text-align: center;">S/N</th> <th style="text-align: center;">Traceability</th> </tr> </thead> <tbody> <tr> <td>IDR300 system / Irradiance Calibration Source</td> <td style="text-align: center;">BENTHAM</td> <td style="text-align: center;">IDR300 / CL6</td> <td style="text-align: center;">15255 / 15093/4</td> <td style="text-align: center;">NMI</td> </tr> <tr> <td>IDR300 system / Irradiance Calibration Source</td> <td style="text-align: center;">BENTHAM</td> <td style="text-align: center;">IDR300 / CL7</td> <td style="text-align: center;">15255 / 15242/2</td> <td style="text-align: center;">NMI</td> </tr> <tr> <td>IDR300 system / Radiance Calibration Source</td> <td style="text-align: center;">BENTHAM</td> <td style="text-align: center;">IDR300 / SRS12</td> <td style="text-align: center;">15255 / 15243/3</td> <td style="text-align: center;">NMI</td> </tr> <tr> <td>Digital Power Meter / DC Source</td> <td style="text-align: center;">YOKOGAWA / Agilent</td> <td style="text-align: center;">WT-210 / B2901A</td> <td style="text-align: center;">91J837766 / MY51140283</td> <td style="text-align: center;">NMI</td> </tr> </tbody> </table>		Name	Brand	Model	S/N	Traceability	IDR300 system / Irradiance Calibration Source	BENTHAM	IDR300 / CL6	15255 / 15093/4	NMI	IDR300 system / Irradiance Calibration Source	BENTHAM	IDR300 / CL7	15255 / 15242/2	NMI	IDR300 system / Radiance Calibration Source	BENTHAM	IDR300 / SRS12	15255 / 15243/3	NMI	Digital Power Meter / DC Source	YOKOGAWA / Agilent	WT-210 / B2901A	91J837766 / MY51140283	NMI
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<p>Summary of testing:</p> <p>This test report was issued for classifying evaluation of potential radiation hazards that may be associated with various lamps and lamp systems only.</p> <p>The compliance with the requirements of other applicable standards may be needed in additional test reports.</p>																										
<p>Copy of marking plate:</p> <p>N/A (not applicable for LED components)</p>																										

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TEST REPORT	
Test item particulars	2835 LED Package
Tested lamp	<input checked="" type="checkbox"/> continuous wave lamps <input type="checkbox"/> pulsed lamps
Tested lamp system	SMD LED
Lamp classification group	<input checked="" type="checkbox"/> exempt <input type="checkbox"/> risk 1 <input type="checkbox"/> risk 2 <input type="checkbox"/> risk 3
Lamp cap	N/A
Bulb	N/A
Rated of the lamp	DC 60 mA, 0.2 W
Furthermore marking on the lamp.....	N/A
Seasoning of lamps according IEC standard.....	Aging 1h
Used measurement instrument.....	According to standard instruments of IEC 62471:2006 / EN 62471:2008
Temperature by measurement.....	(25 ± 2) °C
Information for safety use	Exempt Group
Possible test case verdicts:	
– test case does not apply to the test object.....: N (Not applicable)	
– test object does meet the requirement	
– test object does not meet the requirement	
Testing:	
Date of receipt of test item	Nov. 15, 2013
Date (s) of performance of tests	Nov. 15, 2013 ~ Nov. 25, 2013
General remarks:	
The test results presented in this report relate only to the object tested.	
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"(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 tested items were LED components, and the spectra wavelength range was broadband.	
The wavelength range of <u>67-21S SMD LED (2835 Package), 5700K</u> was from 400 nm to 780 nm, and the CCT was 5700 K.	
The wavelength range of <u>67-21S SMD LED (2835 Package), 3000K</u> was from 400 nm to 800 nm, and the CCT was 3000 K	
LED Specs:	
Manufacturer: EVERLIGHT; Dimension: W 2.8 mm x L 3.5 mm x H 0.7 mm; Voltage: DC 2.9 to 3.6 V (@ 60 mA);	
Model: <u>67-21S SMD LED (2835 Package), 5700K</u> , <u>67-21S SMD LED (2835 Package), 3000K</u>	
Note:	
The radiation hazards comply with the limit level for Exempt Group.	
In our opinion, the classification information shall be included in the product specifications or user instructions.	

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IEC/EN 62471			
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 8-hour 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 luminance of 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 eye		P
	The exposure limit for effective radiant exposure is $30 \text{ J}\cdot\text{m}^{-2}$ within any 8-hour period		P
	To protect against injury of the eye or skin from ultraviolet radiation exposure produced by a broadband source, the effective integrated spectral irradiance, E_s , of the light source shall not exceed the levels defined by:		P
	$E_s \cdot t = \sum_{200}^{400} \sum_t E_\lambda(\lambda, t) \cdot S_{UV}(\lambda) \cdot \Delta t \cdot \Delta \lambda \leq 30 \quad \text{J}\cdot\text{m}^{-2}$		P
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye or skin shall be computed by:		P
	$t_{\max} = \frac{30}{E_s} \quad \text{s}$		P
4.3.2	Near-UV hazard exposure limit for eye		P
	For the spectral region 315 nm to 400 nm (UV-A) 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 $10 \text{ W}\cdot\text{m}^{-2}$.		P
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye for time less than 1000 s, shall be computed by:		P
	$t_{\max} \leq \frac{10000}{E_{UVA}} \quad \text{s}$		P
4.3.3	Retinal blue light hazard exposure limit		N
	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 the levels defined by:		N

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	$L_B \cdot t = \sum_{300}^{700} \sum_t L_\lambda(\lambda, t) \cdot B(\lambda) \cdot \Delta\lambda \leq 10^6 \quad \text{J} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	for $t \leq 10^4 \text{ s}$ $t_{\max} = \frac{10^6}{L_B}$	N
	$L_B = \sum_{300}^{700} L_\lambda \cdot B(\lambda) \cdot \Delta\lambda \leq 100 \quad \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	for $t > 10^4 \text{ s}$	N
4.3.4	Retinal blue light hazard exposure limit - small source		P
	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	P
	$E_B \cdot t = \sum_{300}^{700} \sum_t E_\lambda(\lambda, t) \cdot B(\lambda) \cdot \Delta\lambda \leq 100 \quad \text{J} \cdot \text{m}^{-2}$	for $t \leq 100 \text{ s}$	N
	$E_B = \sum_{300}^{700} E_\lambda \cdot B(\lambda) \cdot \Delta\lambda \leq 1 \quad \text{W} \cdot \text{m}^{-2}$	for $t > 100 \text{ s}$	P
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:		P
	$L_R = \sum_{380}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{50\,000}{\alpha \cdot t^{0,25}} \quad \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	($10 \mu\text{s} \leq t \leq 10 \text{ s}$)	P
4.3.6	Retinal thermal hazard exposure limit – weak visual stimulus		P
	For an infrared heat lamp or any near-infrared 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:		P
	$L_{IR} = \sum_{780}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{6\,000}{\alpha} \quad \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	$t > 10 \text{ s}$	P
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:		P
	$E_{IR} = \sum_{780}^{3000} E_\lambda \cdot \Delta\lambda \leq 18\,000 \cdot t^{-0,75} \quad \text{W} \cdot \text{m}^{-2}$	$t \leq 1000 \text{ s}$	N

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	For times greater than 1000 s the limit becomes:		P
	$E_{IR} = \sum_{380}^{3000} E_{\lambda} \cdot \Delta\lambda \leq 100 \quad W \cdot m^{-2}$	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:		P
	$E_H \cdot t = \sum_{380}^{3000} \sum_t E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta\lambda \leq 20\,000 \cdot t^{0,25} \quad J \cdot m^{-2}$		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.	Risk Group Classification is Exempt Group	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	Not applicable	N
	- the manufacturer's recommendation	Test Condition Input Current: DC 60 mA Head of LED lamp paralleled to optical table for measurement and the measuring distance was 200 mm	P
5.1.5	Lamp system operation	Not applicable	N
	The power source for operation of the test lamp shall be provided in accordance with:	Not applicable	N
	- the appropriate IEC standard, or	Not applicable	N
	- the manufacturer's recommendation	Not applicable	N
5.2	Measurement procedure		P

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5.2.1	Irradiance measurements		P
	Minimum aperture diameter 7mm.		P
	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	Not applicable	N
	The measurements made with an optical system.	Not applicable	N
	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.	Not applicable	N
5.2.2.2	Alternative method		P
	Alternatively to an imaging radiance set-up, an irradiance measurement set-up with a circular field stop placed at the source can be used to perform radiance measurements.		P
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	Not applicable	N
	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.	Not applicable	N
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

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	- 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	Not applicable	N
	- 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		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 (E_S) within 8-hours exposure (30000 s), nor		P
	- a near-UV hazard (E_{UVA}) within 1000 s, (about 16 min), nor		P
	- a retinal blue-light hazard (L_B) within 10000 s (about 2,8 h), nor		P
	- a retinal thermal hazard (L_R) within 10 s, nor		P
	- an infrared radiation hazard for the eye (E_{IR}) 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:	Not applicable	N
	- an actinic ultraviolet hazard (E_S) within 10000 s, nor	Not applicable	N
	- a near ultraviolet hazard (E_{UVA}) within 300 s, nor	Not applicable	N
	- a retinal blue-light hazard (L_B) within 100 s, nor	Not applicable	N
	- a retinal thermal hazard (L_R) within 10 s, nor	Not applicable	N
	- an infrared radiation hazard for the eye (E_{IR}) within 100 s	Not applicable	N
	Lamps that emit infrared radiation without a strong visual stimulus and do not pose a near-infrared retinal hazard (L_{IR}), within 100 s are in Risk Group 1.	Not applicable	N
6.1.3	Risk Group 2 (Moderate-Risk)	Not applicable	N
	This requirement is met by any lamp that exceeds the limits for Risk Group 1, but that does not pose:	Not applicable	N

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IEC/EN 62471			
Clause	Requirement + Test	Result - Remark	Verdict
	- an actinic ultraviolet hazard (E_S) within 1000 s exposure, nor	Not applicable	N
	- a near ultraviolet hazard (E_{UVA}) within 100 s, nor	Not applicable	N
	- a retinal blue-light hazard (L_B) within 0,25 s (aversion response), nor	Not applicable	N
	- a retinal thermal hazard (L_R) within 0,25 s (aversion response), nor	Not applicable	N
	- an infrared radiation hazard for the eye (E_{IR}) within 10 s	Not applicable	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.	Not applicable	N
6.1.4	Risk Group 3 (High-Risk)	Not applicable	N
	Lamps which exceed the limits for Risk Group 2 are in Group 3.	Not applicable	N
6.2	Pulsed lamps	Not applicable	N
	Pulse lamp criteria shall apply to a single pulse and to any group of pulses within 0,25 s.	Not applicable	N
	A pulsed lamp shall be evaluated at the highest nominal energy loading as specified by the manufacturer.	Not applicable	N
	The risk group determination of the lamp being tested shall be made as follows:	Not applicable	N
	- a lamp that exceeds the exposure limit shall be classified as belonging to Risk Group 3 (High-Risk)	Not applicable	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	Not applicable	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	Not applicable	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
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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Table 4.2 Spectral weighting functions for assessing retinal hazards from broadband optical sources

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
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	$10^{\lfloor (450-\lambda)/50 \rfloor}$	1,0
600-700	0,001	1,0
700-1050		$10^{\lfloor (700-\lambda)/500 \rfloor}$

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1050-1150	0,2
1150-1200	$0,2 \cdot 10^{0,02(1150-\lambda)}$
1200-1400	0,02

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 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)

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 10-100 100-10000 ≥ 10000	$0,011 \cdot \sqrt{(t/10)}$ 0,011 $0,0011 \cdot \sqrt{t}$ 0,1	$10^6/t$ $10^6/t$ $10^6/t$ 100
Retinal thermal	$L_R = \sum L_\lambda \cdot R(\lambda) \cdot \Delta\lambda$	380 – 1400	< 0,25 0,25 – 10	0,0017 $0,011 \cdot \sqrt{(t/10)}$	$50000/(\alpha \cdot t^{0,25})$ $50000/(\alpha \cdot t^{0,25})$
Retinal thermal (weak visual stimulus)	$L_{IR} = \sum L_\lambda \cdot R(\lambda) \cdot \Delta\lambda$	780 – 1400	> 10	0,011	$6000/\alpha$

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Table 6.1 Emission limits for risk groups of continuous wave lamps

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	5.81E-04	0,003	-	0,03	-
Near UV		E_{UVA}	$W \cdot m^{-2}$	10	2.58E-04	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*	1.42E-01	1,0	-	400	-
Retinal thermal	$R(\lambda)$	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/ α	1.40E+04	28000/ α	-	71000/ α	-
Retinal thermal, weak visual stimulus**	$R(\lambda)$	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	6000/ α	<1.00E-09	6000/ α	-	6000/ α	-
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	<1.00E-09	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									

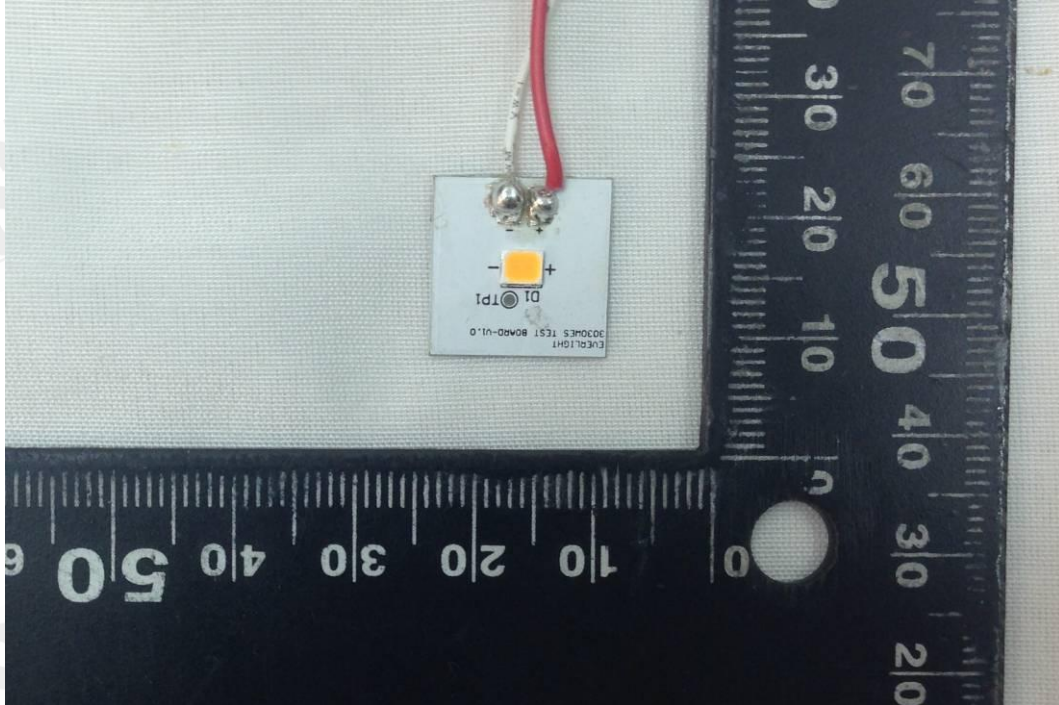
※ Remark:

All the models listed on the report were tested and evaluated upon one tested sample at least, and the test results shown on the report were summarized with the worse one among the tested samples in normal conditions.

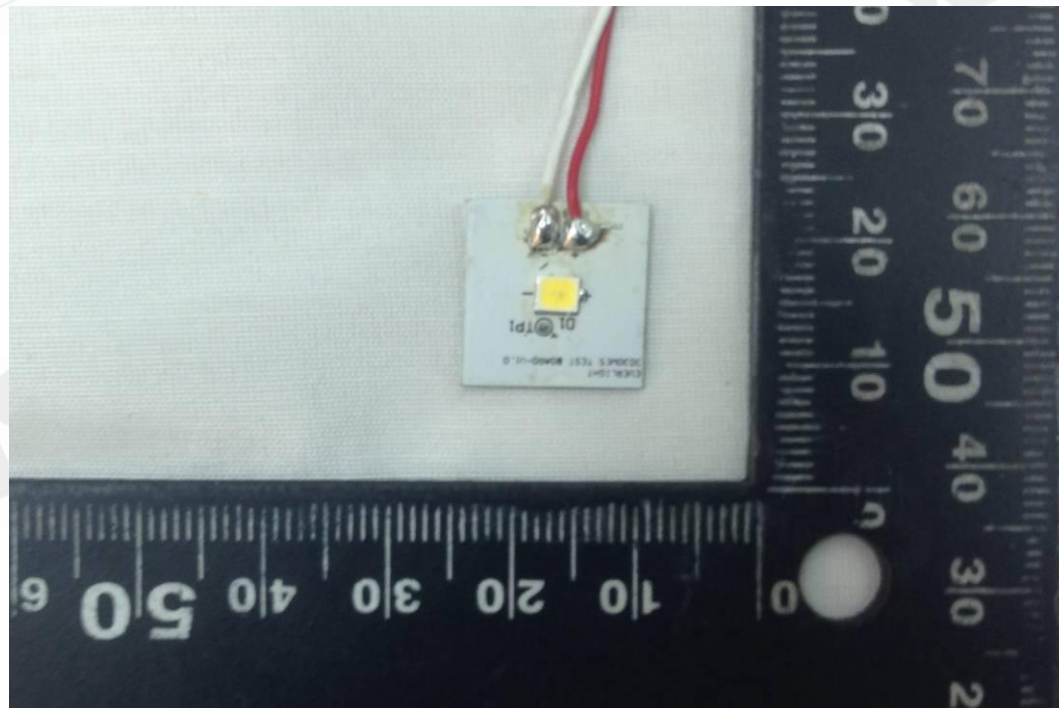
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Attachment Photos



67-21S SMD LED (2835 Package), 3000K



67-21S SMD LED (2835 Package), 5700K

- End of Report -

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