

#### **TEST REPORT**

### IEC 62471:2006

Photobiological safety of lamps and lamp systems

Report reference No ..... RSZ160503550-03A1

Compiled by (+ signature) ...... Park Zeng

Approved by (+ signature) ................................... Rick Xiao

Date of issue ...... 2016-05-04

Testing laboratory ...... Bay Area Compliance Laboratories Corp. (Dongguan)

China.

Testing location ...... Same as above

Applicant ....... Guangzhou Hongli Opto-Electronic Co.,Ltd.

China

Standard ...... IEC 62471:2006

Test sample(s) received...... 2016-05-04

Procedure deviation ...... N.A.

Non-standard test method ...... N.A.

This test report is for the customer shown above and their specific product only. It may not be duplicated or used in part except in full without prior written consent from Bay Area Compliance Laboratories Corp.

(Dongguan).

Type of test object ...... LED

Trademark ...... N.A.

A2835W3H3-D01-7D2AA1 A2835W4H3-D01-7D2AA1 A2835W5H3-D01-7D2AA1 A2835W7H3-D01-7D2AA1

A2835W8H3-D01-7D2AA1 A2835W6H3-D01-8D2AA1 A2835W1H3-D01-8D2AA1 A2835W3H3-D01-8D2AA1 A2835W4H3-D01-8D2AA1 A2835W3H3-D01-8D2AA1

A2835W5H3-D01-8D2AA1 A2835W7H3-D01-8D2AA1

A2835W8H3-D01-8D2AA1





General	product	information:
Ochiciai	DIOGUCE	minomination.

Model	Input parameters	сст
A2835W1H3-D01-7D2AA1		2700K
A2835W2H3-D01-7D2AA1 A2835W3H3-D01-7D2AA1	-	3000K 4000K
A2835W4H3-D01-7D2AA1		5000K
A2835W5H3-D01-7D2AA1 A2835W6H3-D01-7D2AA1	_	6000K 6500K
A2835W6H3-D01-7D2AA1 A2835W7H3-D01-7D2AA1	-	2200K
A2835W8H3-D01-7D2AA1	5V <sub>dc</sub>	3500K
A2835W1H3-D01-8D2AA1 A2835W2H3-D01-8D2AA1	150mA	2700K 3000K
A2835W3H3-D01-8D2AA1		4000K
A2835W4H3-D01-8D2AA1 A2835W5H3-D01-8D2AA1	-	5000K 6000K
A2835W6H3-D01-8D2AA1		6500K
A2835W7H3-D01-8D2AA1 A2835W8H3-D01-8D2AA1	-	2200K 3500K

From Appendix A product similarity declaration, all models have the same or similar appearance, structure, PCB, Material and function. Their difference just in model name and CCT. 6500K is the worse case, which could cover other CCT. Unless otherwise specified, the A2835W6H3-D01-7D2AA1 was chosen as the representative models to perform the test.

This report is based on the BACL report No: RSZ151231550-03. The differences only change model name to "A2835W1H3-D01-7D2AA1, A2835W2H3-D01-7D2AA1, A2835W3H3-D01-7D2AA1, A2835W4H3-D01-7D2AA1, A2835W5H3-D01-7D2AA1, A2835W6H3-D01-7D2AA1, A2835W8H3-D01-7D2AA1, A2835W1H3-D01-8D2AA1, A2835W2H3-D01-8D2AA1, A2835W3H3-D01-8D2AA1, A2835W4H3-D01-8D2AA1, A2835W6H3-D01-8D2AA1, A2835W7H3-D01-8D2AA1, A2835W7H3-D01-8D2AA1, A2835W8H3-D01-8D2AA1, A2835W7H3-D01-8D2AA1, A2835W8H3-D01-8D2AA1, A2835W7H3-D01-8D2AA1, A2835W8H3-D01-8D2AA1, A2835W7H3-D01-8D2AA1, A2835W8H3-D01-8D2AA1, A2835W7H3-D01-8D2AA1, A2835W8H3-D01-8D2AA1, A2835W8H3-D01-8D2AA1, A2835W7H3-D01-8D2AA1, A2835W8H3-D01-8D2AA1, A2835W



	IEC 62471:2006	110210000	)3550-03A
Clause	Requirement + Test	Result - Remark	Verdict
4	EXPOSURE LIMITS		Р
T	Contents of the whole Clause 4 of IEC 62471: 2006 moved into a new informative Annex ZB		Р
	Clause 4 replaced by the following:		Р
	Limits of the Artificial Optical Radiation Directive(2006/25/EC) have been applied instead of those fixed in IEC 62471: 2006	See the Table 6.1	Р
Annex ZB	EXPOSURE LIMITS		Р
4.1	General		Р
	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		Р
	Detailed spectral data of a light source are generally required only if the luminance of the source exceeds 10 <sup>4</sup> cd m <sup>-2</sup>	>10 <sup>4</sup> cd m <sup>-2</sup>	Р
4.3	Hazard exposure limits		Р
4.3.1	Actinic UV hazard exposure limit for the skin and eye		Р
	The exposure limit for effective radiant exposure is 30 J.m <sup>-2</sup> within any 8-hour period		Р
	To protect against injury of the eye or skin from ultraviolet radiation exposure produced by a broadband source, the effective integrated spectral irradiance, Es, of the light source shall not exceed the levels defined by:	Es =1.8×10 <sup>-6</sup> W·m <sup>-2</sup>	Р
	$E_{s} \cdot t = \sum_{200 \ t}^{400} E_{\lambda}(t) \cdot S_{uv}(t) \cdot t \cdot 30  J \cdot m^{-2}$		Р
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye or skin shall be computed by:		Р
	t <sub>max</sub> =30/E <sub>s</sub>	$t_{\text{max}} = 30/(1.8 \times 10^{-6}) = 1.6 \times 10^{7} \text{s}$	Р
4.3.2	Near-UV hazard exposure limit for eye		Р
	For the spectral region 315 nm to 400 nm (UV-A) the total radiant exposure to the eye shall not exceed 10000 J.m <sup>2</sup> for exposure times less than 1000s. For exposure times greater than 1000 s (approximately 16 minutes) the UV-A irradiance for the unprotected eye, E <sub>UVA</sub> , shall not exceed 10 W·m <sup>2</sup>	E <sub>UVA</sub> =5.5×10 <sup>-4</sup> W·m <sup>-2</sup>	Р
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye for time less than 1000 s, shall be computed by:		N





	IEC 62471:2006		
Clause	Requirement + Test	Result - Remark	Verdict
	t <sub>max</sub> 10000/E <sub>UVA</sub> s		N
4.3.3	Retinal blue light hazard exposure limit		Р
	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:		Р
	$L_{B} t = L_{300 \ t} L_{(t)} \cdot B(t) \cdot t \cdot 10^{6} \text{ J} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$		N
	$L_B = {}^{700}_{300} L_{\text{A}} \cdot B(\ ) \cdot 100  \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	L <sub>B</sub> =40 W·m <sup>-2</sup> ·sr <sup>-1</sup>	Р
4.3.4	Retinal blue light hazard exposure limit - small source	= 0.0335 rad	N
	Thus the spectral irradiance at the eye E_, weighted against the blue-light hazard function B(_) shall not exceed the levels defined by: see table 4.2		N
	$E_{\rm B} \cdot t = E_{\rm A}(t,t) \cdot B(t) \cdot t \cdot 100 \text{ J} \cdot \text{m}^{-2}$		N
	$E_B = \sum_{300}^{700} E_{\lambda} \cdot B(\ ) \cdot \qquad 1 \qquad \text{W} \cdot \text{m}^{-2}$		N
4.3.5	Retinal thermal hazard exposure limit		Р
	To protect against retinal thermal injury, the integrated spectral radiance of the light source, L_, weighted by the burn hazard weighting function R(_) (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_{\lambda} L_{\lambda} \cdot R(\lambda) \cdot \Delta \lambda \le \frac{50000}{40.25} $ W·m <sup>-2</sup> ·sr <sup>-1</sup>	$L_R = 4.2 \times 10^3 \text{W} \cdot \text{m}^{-2} \cdot \text{sr}^{-1}$	Р

4.3.6 Retinal thermal hazard exposure limit – weak visual stimulus



$L_{\rm IR} = \sum_{780}^{1400} L_{\lambda} \cdot R(\lambda) \cdot \Delta\lambda \leq \frac{6000}{\alpha} \qquad W \cdot m^2 \cdot sr^{-1} \qquad L_{\rm IR} = 3.6  W \cdot m^2 \cdot sr^{-1} \qquad \qquad P$ $4.3.7 \qquad \text{Infrared radiation hazard exposure limits for the eye}$ $\text{The avoid thermal injury of the cornea and possible delayed effects upon the lens of the eye (cataractogenesis), ocular exposure to infrared radiation, Elk, over the wavelength range 780 mm to 3000 nm, for times less than 1000 s, shall not exceed: E_{\rm IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta\lambda \leq 18000 \cdot t^{-0,75} \qquad W \cdot m^2 E_{\rm IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta\lambda \leq 100 \qquad W \cdot m^2 E_{\rm IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta\lambda \leq 100 \qquad W \cdot m^2 4.3.8 \qquad \text{Thermal hazard exposure limit for the skin} V \text{isible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be limited to: } P E_{\rm H} \cdot t = \sum_{380}^{300} E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta \lambda \leq 20000 \cdot t^{0.25} \qquad J \cdot m^2 E_{\rm H} \cdot t = 0.0 \cdot m^2 E_{\rm H} \cdot t = 0.$		IEC 62471:2006		
	Clause	Requirement + Test	Result - Remark	Verdict
$ \begin{array}{c} \text{eye} \\ \hline \text{The avoid thermal injury of the cornea and} \\ possible \\ delayed effects upon the lens of the eye \\ (cataractogenesis), coular exposure to infrared \\ radiation, EIR, over the wavelength range 780 nm to 3000 nm, for times less than 1000 s, shall not exceed: \\ \hline E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta \lambda \leq 18000 \cdot t^{-0.75} \qquad W \cdot m^2 \\ \hline E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta \lambda \leq 18000 \cdot t^{-0.75} \qquad W \cdot m^2 \\ \hline E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta \lambda \leq 100 \qquad W \cdot m^2 \\ \hline E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta \lambda \leq 100 \qquad W \cdot m^2 \\ \hline E_{IR} = 0 \text{ W·m}^2 \qquad P \\ \hline 4.3.8 \qquad \text{Thermal hazard exposure limit for the skin} \qquad P \\ \hline \text{Visible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be limited to: } \\ \hline E_{H} \cdot t = \sum_{300}^{3000} \sum_{k} E_{\lambda}(\lambda, t) \Delta t \cdot \Delta \lambda \leq 20000 \cdot t^{0.25} \qquad J \cdot m^2 \\ \hline E_{H} \cdot t = 0.0 \cdot m^2 \qquad P \\ \hline \\ \hline S \qquad \text{MEASUREMENT OF LAMPS AND LAMP} \qquad P \\ \hline \text{SYSTEMS} \qquad P \\ \hline 5.1 \qquad \text{Measurement conditions shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.} \\ \hline 5.1.1 \qquad \text{Lamp ageing (seasoning)} \qquad N \\ \hline \\ \hline \text{Seasoning of lamps shall be done as stated in the Appropriate EN lamp standard.} \\ \hline \text{For specific test conditions, see the appropriate EN lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.} \\ \hline \\ \hline \\ \hline $		$L_{\rm IR} = \sum_{780}^{1400} L_{\lambda} \cdot R(\lambda) \cdot \Delta \lambda \le \frac{6000}{\alpha} $ W·m <sup>-2</sup> ·sr <sup>-1</sup>	L <sub>IR</sub> = 3.6 W·m <sup>-2</sup> ·sr <sup>-1</sup>	Р
$\begin{array}{c} \text{possible} \\ \text{delayed effects upon the lens of the eye} \\ \text{(cataractogenesis), ocular exposure to infrared} \\ \text{radiation, EIR, over the wavelength range 780 nm} \\ \text{to 3000 nm, for times less than } 1000 \text{ s, shall not} \\ \text{exceed:} \\ \\ \\ E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta \lambda \leq 18000 \cdot t^{-0.75} \qquad \text{W·m}^2 \\ \\ \\ For times greater than } 1000 \text{ s the limit becomes:} \\ \\ E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta \lambda \leq 100 \qquad \text{W·m}^2 \\ \\ \\ \\ E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta \lambda \leq 100 \qquad \text{W·m}^2 \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	4.3.7	-		Р
$E_{IR} = \sum_{780} E_{\lambda} \cdot \Delta \lambda \leq 18000 \cdot t^{-0.75} \qquad \text{W·m}^2$ For times greater than 1000 s the limit becomes: $E_{IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta \lambda \leq 100 \qquad \text{W·m}^2 \qquad E_{IR} = 0 \text{ W·m}^2 \qquad P$ $4.3.8 \qquad \text{Thermal hazard exposure limit for the skin} \qquad P$ Visible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be limited to: $E_{H} \cdot t = \sum_{3000}^{3000} \sum_{L} E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta \lambda \leq 20000 \cdot t^{0.25} \qquad J \cdot m^2$ $E_{H} \cdot t = 0 \text{J·m}^2 \qquad P$ $E_{H} \cdot t = \sum_{3000}^{3000} \sum_{L} E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta \lambda \leq 20000 \cdot t^{0.25} \qquad J \cdot m^2$ $E_{H} \cdot t = 0 \text{J·m}^2 \qquad P$ $E_{H} \cdot t = 0 $		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		N
$E_{\rm IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta \lambda \leq 100 \qquad \qquad W \cdot m^2 \qquad E_{\rm IR} = 0 \ W \cdot m^2 \qquad \qquad P$ $4.3.8 \qquad \text{Thermal hazard exposure limit for the skin} \qquad \qquad p$ $\text{Visible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be limited to:} \qquad \qquad p$ $E_{\rm H} \cdot t = \sum_{380}^{3000} \sum_{t} E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta \lambda \leq 20000 \cdot t^{0.25} \qquad J \cdot m^2 \qquad E_{\rm H} \cdot t = 0 \ J \cdot m^2 \qquad \qquad P$ $E_{\rm H} \cdot t = \sum_{380}^{3000} \sum_{t} E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta \lambda \leq 20000 \cdot t^{0.25} \qquad J \cdot m^2 \qquad \qquad E_{\rm H} \cdot t = 0 \ J \cdot m^2 \qquad \qquad P$ $E_{\rm H} \cdot t$				N
4.3.8 Thermal hazard exposure limit for the skin  Polysible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be limited to: $E_{H} \cdot t = \sum_{380}^{3000} \sum_{t} E_{\lambda}(\lambda, t) \ \Delta t \cdot \Delta \lambda \le 20000 \cdot t^{0.25} \qquad \text{J·m}^{-2}$ EH \cdot t = 0J·m^{-2}  Polysible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be limited to: $E_{H} \cdot t = \sum_{380}^{3000} \sum_{t} E_{\lambda}(\lambda, t) \ \Delta t \cdot \Delta \lambda \le 20000 \cdot t^{0.25} \qquad \text{J·m}^{-2}$ EH \cdot t = 0J·m^{-2}  Polysible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be limited to:  EH \cdot t = 0J·m^{-2}  Polysible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.  5.1.1 Lamp ageing (seasoning)  Seasoning of lamps shall be done as stated in the Appropriate EN lamp standard.  Test environment  25.3  Polysible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.  Polysible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.  Polysible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.  Polysible and infrared radiant exposure (380 nm) of the evaluation against the exposure limits and the assignment of risk classification.  Polysible and the exposure limits and the assignment of risk classification.  Polysible and the exposure limits and the assignment exposure limits and the assignment of risk classification.  Polysible and the exposure limits and the assignment exposure				Р
Visible and infrared radiant exposure (380 nm to 3000 nm) of the skin shall be limited to: $E_{H} \cdot t = \sum_{380}^{5000} \sum_{t} E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta \lambda \le 20000 \cdot t^{0.25} \qquad \text{J-m}^{-2}$ $E_{H} \cdot t = 0 \text{J-m}^{-2} \qquad P$ $E_{H} \cdot t = \sum_{380}^{5000} \sum_{t} E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta \lambda \le 20000 \cdot t^{0.25} \qquad \text{J-m}^{-2}$ $E_{H} \cdot t = 0 \text{J-m}^{-2} \qquad P$ $E_{H} \cdot $		$E_{\rm IR} = \sum_{780}^{3000} E_{\lambda} \cdot \Delta \lambda \le 100 \qquad \text{W} \cdot \text{m}^{-2}$	E <sub>IR</sub> = 0 W⋅m <sup>-2</sup>	Р
$E_{H} \cdot t = \sum_{380}^{3000} \sum_{t} E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta \lambda \leq 20000 \cdot t^{0.25} \qquad J \cdot m^{-2} \qquad E_{H} \cdot t = 0 J \cdot m^{-2} \qquad P$ $E_{H} \cdot t = \sum_{380}^{3000} \sum_{t} E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta \lambda \leq 20000 \cdot t^{0.25} \qquad J \cdot m^{-2} \qquad E_{H} \cdot t = 0 J \cdot m^{-2} \qquad P$ $E_{H} \cdot t = 0 J \cdot m^{-2} \qquad E_{H} \cdot t = 0 J \cdot m^{-2} \qquad P$ $E_{H} $	4.3.8	Thermal hazard exposure limit for the skin		Р
$E_{\mathrm{H}} \cdot t = \sum_{380} \sum_{t} E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta \lambda \leq 20000 \cdot t^{0.25} \qquad \mathrm{J} \cdot \mathrm{m}^{-2}$ $ $				Р
SYSTEMS  5.1 Measurement conditions  Measurement conditions shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.  5.1.1 Lamp ageing (seasoning)  N  Seasoning of lamps shall be done as stated in the Appropriate EN lamp standard.  5.1.2 Test environment  25.3  P  For specific test conditions, see the appropriate EN lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.		$E_{H} \cdot t = \sum_{380}^{3000} \sum_{t} E_{\lambda}(\lambda, t) \cdot \Delta t \cdot \Delta \lambda \le 20000 \cdot t^{0,25} $ J·m <sup>-2</sup>	E <sub>H</sub> ·t= 0J·m <sup>-2</sup>	Р
SYSTEMS  5.1 Measurement conditions  Measurement conditions shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.  5.1.1 Lamp ageing (seasoning)  N  Seasoning of lamps shall be done as stated in the Appropriate EN lamp standard.  5.1.2 Test environment  25.3  P  For specific test conditions, see the appropriate EN lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.	5	MEASUREMENT OF LAMPS AND LAMP		
Measurement conditions shall be reported as part of the evaluation against the exposure limits and the assignment of risk classification.  5.1.1 Lamp ageing (seasoning)  Seasoning of lamps shall be done as stated in the Appropriate EN lamp standard.  5.1.2 Test environment  25.3  P  For specific test conditions, see the appropriate EN lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.		SYSTEMS		Р
of the evaluation against the exposure limits and the assignment of risk classification.  5.1.1 Lamp ageing (seasoning)  Seasoning of lamps shall be done as stated in the Appropriate EN lamp standard.  5.1.2 Test environment  25.3  P  For specific test conditions, see the appropriate EN lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.	5.1	Measurement conditions		Р
5.1.1 Lamp ageing (seasoning)  Seasoning of lamps shall be done as stated in the Appropriate EN lamp standard.  5.1.2 Test environment  25.3  P  For specific test conditions, see the appropriate EN lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.		of the evaluation against the exposure limits and		Р
Appropriate EN lamp standard.  5.1.2 Test environment  25.3 P  For specific test conditions, see the appropriate EN lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.	5.1.1			N
5.1.2 Test environment  25.3  For specific test conditions, see the appropriate EN lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.				N
EN lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.	5.1.2		25.3	Р
5.1.3 Extraneous radiation		EN lamp standard or in absence of such standards, the appropriate national standards or manufacturer's recommendations.		Р
D. T. C. T.	5.1.3	Extraneous radiation		Р





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Clause	Requirement + Test	Result - Remark	Verdict
	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		Р
	Operation of the test lamp shall be provided in accordance with:		Р
	- the appropriate EN lamp standard, or		N
	- the manufacturer's recommendation		Р
5.1.5	Lamp system operation		N
	The power source for operation of the test lamp shall be provided in accordance with:		N
	- the appropriate EN standard, or		N
	- the manufacturer's recommendation		N
5.2	Measurement procedure		Р
5.2.1	Irradiance measurements		Р
	Minimum aperture diameter 7mm.		Р
	Maximum aperture diameter 50 mm.		Р
	The measurement shall be made in that position of the beam giving the maximum reading.		Р
	The measurement instrument is adequate calibrated.	See appendix B	Р
5.2.2	Radiance measurements		Р
5.2.2.1	Standard method		Р
	The measurements made with an optical system.		Р
	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.		Р

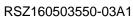
5.2.2.2 Alternative method



	on plante V Labo corp.	RSZ	160503550-03A
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Clause	Requirement + Test	Result - Remark	Verdict
	To standardize interpolated values, use linear interpolation on the log of given values to obtain intermediate points at the wavelength intervals desired.		N
5.3.2	Calculations		Р
	The calculation of source hazard values shall be performed by weighting the spectral scan by the appropriate function and calculating the total weighted energy.		Р
5.3.3	Measurement uncertainty		Р
	The quality of all measurement results must be quantified by an analysis of the uncertainty.		Р
6	LAMP CLASSIFICATION		Р
	For the purposes of this standard it was decided that the values shall be reported as follows:		Р
	<ul> <li>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</li> </ul>		N
	<ul> <li>for all other light sources, including pulsed lamp sources, the hazard values shall be reported at a distance of 200 mm</li> </ul>	200mm	Р
6.1	Continuous wave lamps		Р
6.1.1	Exempt Group		Р
	In the except group are lamps, which does not pose any photobiological hazard. The requirement is met by any lamp that does not pose:		Р
	<ul> <li>an actinic ultraviolet hazard (ES) within 8-hours exposure (30000 s), nor</li> </ul>		Р
	<ul><li>– a near-UV hazard (EUVA) within 1000 s, (about 16 min), nor</li></ul>		Р
	<ul><li>– a retinal blue-light hazard (LB) within 10000 s (about 2,8 h), nor</li></ul>		Р
	- a retinal thermal hazard (LR) within 10 s, nor		Р
	<ul> <li>an infrared radiation hazard for the eye (EIR) within 1000 s</li> </ul>		Р
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
	<ul><li>– an actinic ultraviolet hazard (ES) within 10000 s, nor</li></ul>		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
	<ul> <li>an infrared radiation hazard for the eye (EIR) within 100 s</li> </ul>		N



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Clause	Requirement + Test	Result - Remark	Verdict
	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
	<ul> <li>an actinic ultraviolet hazard (ES) within 1000 s exposure, nor</li> </ul>		N
	<ul><li>– a near ultraviolet hazard (EUVA) within 100 s, nor</li></ul>		N
	<ul> <li>a retinal blue-light hazard (LB) within 0,25 s (aversion response), nor</li> </ul>		N
	<ul> <li>a retinal thermal hazard (LR) within 0,25 s</li> <li>(aversion response), nor</li> </ul>		N
	<ul> <li>an infrared radiation hazard for the eye (EIR) within 10 s</li> </ul>		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
	<ul> <li>a lamp that exceeds the exposure limit shall be classified as belonging to Risk Group 3 (High- Risk)</li> </ul>		N
	<ul> <li>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</li> </ul>		N
	<ul> <li>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</li> </ul>		N





				000 00,
		IEC 62471:2006		
Clause	Requirement + Test	t	Result - Remark	Verdict



		IEC 62471:2006		
Clause	Requirement + Test		Result - Remark	Verdict

Wavel	enath	Blue-light hazard function	Burn hazard function
nı	_	B()	R()
30		0.01	-
30		0.01	-
31		0.01	-
31		0.01	-
32		0.01	-
32		0.01	-
33		0.01	-
33		0.01	-
34		0.01	-
34		0.01	-
35		0.01	-
35		0.01	-
36		0.01	
36		0.01	
37		0.01	-
37		0.01	-
38		0.01	0.1
38		0.013	0.13
39		0.025	0.25
39		0.05	0.5
40		0.10	1.0
40		0.20	2.0
41		0.40	4.0
41		0.80	8.0
42		0.90	9.0
42		0.95	9.5
43		0.98	9.8
43	And the latest control of	1.00	10.0
44		1.00	10.0
44		0.97	9.7
45		0.94	9.4
45		0.90	9.0
46		0.80	8.0
46		0.70	7.0
47		0.62	6.2
47		0.55	5.5
48		0.45	4.5
48		0.40	4.0
49		0.22	2.2
49		0.16	1.6
500-		10 <sup>[(450-)/50]</sup>	1.0
600-		0.001	1.0
700-		0.013	10 <sup>[(700-)/500]</sup>
1050-		0.025	0.2
			0.2
1150-	1400	0.05 0.10	0.02

<sup>\* 1</sup> Wavelengths chosen are representative: other values should be obtained by logarithmic interpolationat intermediate wavelengths.
Emission lines of a mercury discharge spectrum.



		IEC 62471:2006		
Clause	Requirement + Test		Result - Remark	Verdict

Table 5.4	Summary of the E based values)	-			
Hazard Name	Relevant equation	Wavelength Explosure aperture rad(deg)		Limiting aperture rad(deg)	EL in items of constant irradiance W.m <sup>-2</sup>
Actinic UV skin & eye	E <sub>S</sub> = E • S( )	200 – 400	< 30000	1.4 (80)	30/t
Eye UV-A	E <sub>UVA</sub> = E ◆	315 – 400	1000 >1000	1.4 (80)	10000/t 10
Blue-light small source	E <sub>B</sub> = E • B( )	300 – 700	100 >100	< 0.011	100/t 1,0
Eye IR	E <sub>IR</sub> = E •	780 –3000	1000 >1000	1.4 (80)	18000/t <sup>0,75</sup> 100
Skin thermal	E <sub>H</sub> = E •	380 – 3000	< 10	2 sr	20000/t <sup>0,75</sup>

Table 5.5	Summary of the E	-			
Hazard Name	Relevant equation	Wavelength Range nm	Explosure duration Sec	Field of view radians	EL in terms of constant radiance W.m <sup>-2</sup> .sr <sup>-1</sup> )
Blue light	$L_B = L \cdot B() \cdot$	300 – 700	0.25 - 10 10-100 100-10000 10000	0.011• (t/10) 0.011 0.0011• t 0.1	10 <sup>6</sup> /t 10 <sup>6</sup> /t 10 <sup>6</sup> /t 100
Retinal thermal	$L_R = L \cdot R() \cdot$	380 – 1400	< 0,25 0.25 – 10	0,0017 0.011• (t/10)	50000/( •t 0,25) 50000/( •t 0,25)
Retinal thermal (weak visual stimulus)	L <sub>IR</sub> = L • R( ) •	780 – 1400	> 10	0.011	6000/



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Clause	Requirement + Test	Result - Remark	Verdict			

Table 6.1	Emission limits for risk groups of continuous wave lamps base on Directive(2006/25/EC)								Р
Risk	Action spectrum	Units	Symbol	Exempt		Low risk		Mod risk	
				Limit	Result	Limit	Result	Limit	Result
Actinic UV	Suv( )	W.m <sup>-2</sup>	Es	0.001	1.8×10 <sup>-6</sup>	0.003	-	0.03	
Near UV		W.m <sup>-2</sup>	E <sub>UVA</sub>	10	5.5×10 <sup>-4</sup>	33		100	
Blue light	B( )	W.m <sup>-2</sup> .sr <sup>-1</sup>	L <sub>B</sub>	100	40	10000		4000000	
Blue light,small source	В( )	W.m <sup>-2</sup>	E <sub>B</sub>	1		1		400	
Retinal thermal	R( )	W.m <sup>-2</sup> .sr <sup>-1</sup>	L <sub>R</sub>	28000/ ( =0.0335)	4.2×10 <sup>3</sup>	28000/ ( =0.0335)		71000/ ( =0.0335)	
Retinal thermal, Weak visual stimulus**	R( )	W.m <sup>-2</sup> .sr <sup>-1</sup>	L <sub>IR</sub>	6000/ ( =0.0335)	3.6	6000/ ( =0.0335)		28000/ ( =0.0335)	
IR radiation Eye		W.m <sup>-2</sup>	E <sub>IR</sub>	100	0	570		3200	

<sup>\*</sup> Small source defined as one with  $\alpha$  < 0,011 radian. Averaging field of view at 10000 s is 0,1 radian.

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

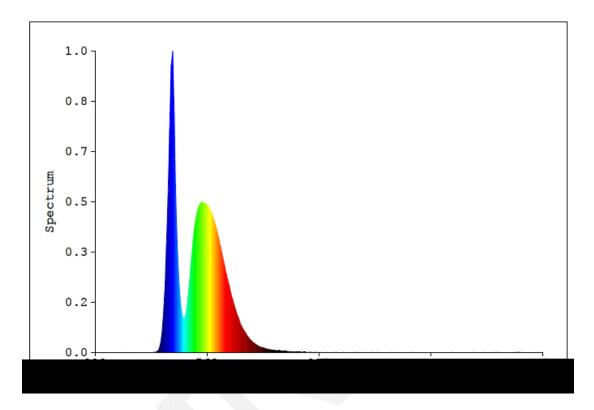
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5

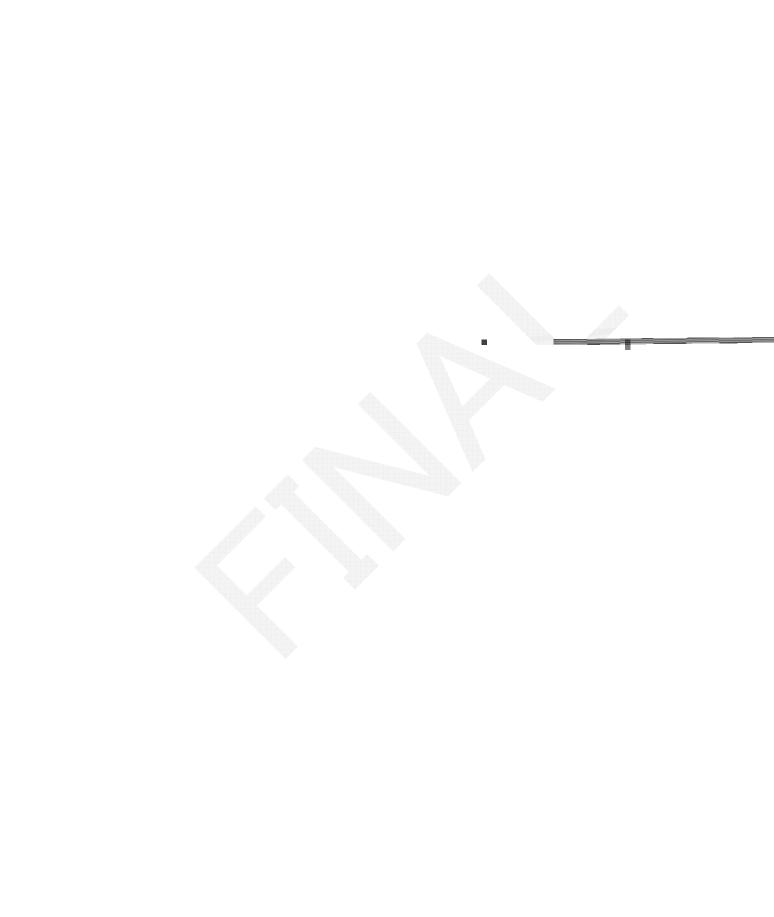
<sup>\*\*</sup> Involves evaluation of non-GLS source



# Appendix I Firgure of Spectral distribution

## **Spectral distribution**



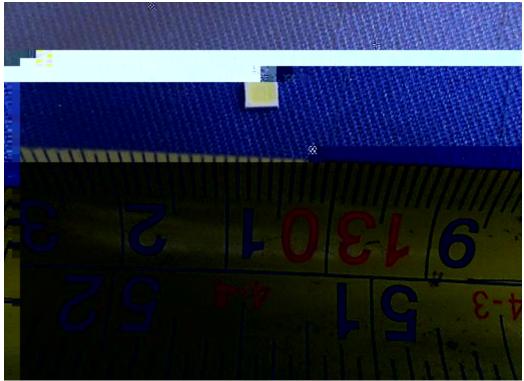




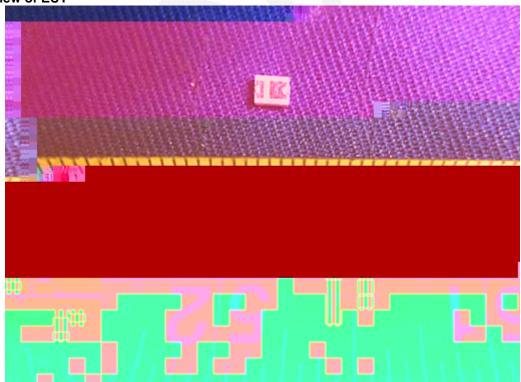


## Appendix B –EUT Photos

## The front view of EUT



## The back view of EUT





# Appendix C -Test equipment list

Equipment Description	Model No	BACL#	Manufacturer	Last Cal	Cal Due
UV light leakage spectrum of biological safety systems	PMS-700	T-08-SF140	EVERFINE	2014-12-30	2016-12-29
Imaging luminance meter	CX-2K	T-08-SF140-1	EVERFINE	2014-12-30	2016-12-29
Radio meter	RD-2000	T-08-SF140-2	EVERFINE	2014-12-30	2016-12-29
Radio meter	RD-2000	T-08-SF140-3	EVERFINE	2014-12-30	2016-12-29
high-accuracy digital photometer head	HAAS-2000	T-08-SF140-4	EVERFINE	2014-12-30	2016-12-29
Hygrothermograph	PWS280	T-08-QA026	N/A	2016-03-21	2017-03-20
Standard power spectral UV radiation-specific	UVS-8003	T-08-EE048	EVERFINE	2016-03-21	2017-03-20
80mm sample integrating sphere	SMS-300	F-08-SF130	EVERFINE	2014-12-26	201612-25
Steel tape	HILOCK-19	T-08-SF100	TAJIMA	2013-04-18	2018-04-17

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