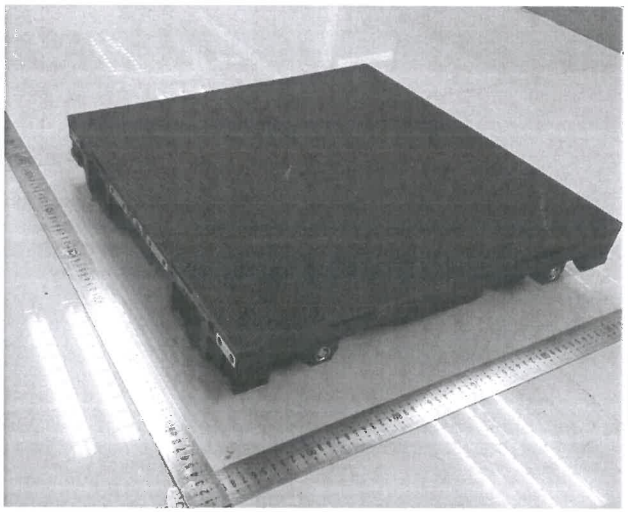
Prüfbericht-Nr.: *Test Report No.:*	50052581 002	**Auftrags-Nr.:** *Order No.:*	164076892	Seite 1 von 12 *Page 1 of 12*
Kunden-Referenz-Nr.: *Client Reference No.:*	N/A	**Auftragsdatum:** *Order date:*	Oct. 25, 2016	
Auftraggeber: *Client:*	Shenzhen Absen Optoelectronic Co., Ltd. 18-20/F, Tower A, Building 3, Phase I, Tian An Cloud Park, NO.2018, Xuegang Rd, Bantian, Longgang Dsitrict, Shenzhen, Guangdong, P.R China			
Prüfgegenstand: *Test item:*	FULL COLOR LED DISPLAY			
Bezeichnung / Typ-Nr.: *Identification / Type No.:*	M2.3, M3.4, M2.9			
Auftrags-Inhalt: *Order content:*	TÜV Rheinland LVD CoC approval			
Prüfgrundlage: *Test specification:*	EN 60950-1:2006 + A11 + A1 + A12 + A2			
Wareneingangsdatum: *Date of receipt:*	Oct. 25, 2016			
Prüfmuster-Nr.: *Test sample No.:*	BL-SZ16A0137			
Prüfzeitraum: *Testing period:*	Oct. 27, 2016 to Nov. 04, 2016			
Ort der Prüfung: *Place of testing:*	See page 4			
Prüflaboratorium: *Testing laboratory:*	TÜV Rheinland (Shenzhen) Co., Ltd. East of F/1, F/2 - F/4, Building 1, Cybio Technology Building, No. 6 Langshan No. 2 Road, North Hi-tech Industry Park, Nanshan District, Shenzhen, P.R. China			
Prüfergebnis*: *Test result*:*	Pass			



geprüft von / *tested by*:

Julia Yan

Nov. 07.2016 Julia Yan/Project Engineer

Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

kontrolliert von / *reviewed by*:

Wayne Wang

Nov. 07.2016 Wayne Wang / Technical Certifier

Datum *Date*	**Name / Stellung** *Name / Position*	**Unterschrift** *Signature*

Sonstiges / *Other*:

1. This report is based on TUV Rheinland LVD report 50052581 001 for modification, see page 8 for details.
2. Test report (contains 12 pages (include 1 page of cover page); Attachment 1: EN 62471 test report (19 pages); Attachment 2: Equipment List attached (1 page); Attachment 3: EMF assessment report (1 page).

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery:*	Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged*

* Legende:	1 = sehr gut	2 = gut	3 = befriedigend	4 = ausreichend	5 = mangelhaft
	P(ass) = entspricht o.g. Prüfgrundlage(n)		F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
Legend:	*1 = very good*	*2 = good*	*3 = satisfactory*	*4 = sufficient*	*5 = poor*
	P(ass) = passed a.m. test specification(s)		*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

TEST REPORT

IEC 60950-1
Information technology equipment – Safety – Part 1: General requirements

Report Number. .....:	50052581 002
Date of issue .....:	See cover page
Total number of pages.....	See cover page
Applicant's name .....:	See cover page
Address .....:	See cover page
Test specification:	
Standard.....:	See cover page
Test procedure .....:	TUV Rheinland LVD CoC
Non-standard test method .....:	N/A
Test Report Form No. .....:	IEC60950_1F
Test Report Form(s) Originator ....:	SGS Fimko Ltd
Master TRF.....:	Dated 2014-02

If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

General disclaimer:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing CB Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the NCB, responsible for this Test Report.

Test item description .....:	FULL COLOR LED DISPLAY
Trade Mark .....:	Absen LED
Manufacturer .....:	Same as applicant
Model/Type reference .....:	M2.9, **M2.3, M3.4**
Ratings .....:	Input: 100-240V~, 50/60Hz, 12A Output: 100-240V~, 50/60Hz, 10.4A

Testing procedure and testing location:			
☐	**CB Testing Laboratory:**	See cover page	
Testing location/ address.....:		See cover page	
☐	**Associated CB Testing Laboratory:**	N/A	
Testing location/ address.....:		N/A	
Tested by (name + signature).....:		N/A	
Approved by (name + signature).....:		N/A	
☒	**Testing procedure: TMP/CTF Stage 1:**		
Testing location/ address.....:			
Tested by (name + signature).....:		See cover page	
Approved by (name + signature).....:		See cover page	
☐	**Testing procedure: WMT/CTF Stage 2:**	N/A	
Testing location/ address.....:		N/A	
Tested by (name + signature).....:			
Witnessed by (name + signature).....:			
Approved by (name + signature).....:			
☐	**Testing procedure: SMT/CTF Stage 3 or 4:**	N/A	
Testing location/ address.....:		N/A	
Tested by (name + signature).....:			
Witnessed by (name + signature).....:			
Approved by (name + signature).....:			
Supervised by (name + signature).....:			

List of Attachments (including a total number of pages in each attachment):

- See cover page

Summary of testing:

The tests were carried out under the most unfavourable combination within the manufacturer's operating specifications of the following parameters:

- supply voltage, which ranged from AC100-240V;
- operating temperature, max. ambient temperature 40°C declared by the client;
- operating mode: continuous;
- operating load: full white screen, AC output connector load with 10.4A.

Tests performed (name of test and test clause):

Clause(s)	Test(s)
1.6.2	Input Current Test
4.5.2	Heating Test

Note:

1. For temperature test the thermocouples method used, regarding fault condition test simulated faults applied.
2. EUT pass all the tests.

Testing location:

1. For test report according to EN 60950-1:2006 + A11 + A1 + A12 + A2:

Shenzhen BALUN Technology Co., Ltd.

Block B, 1st FL, Baisha Science and Technology Park, Shahe Xi Road, Nanshan District, Shenzhen, Guangdong Province. P. R. China.

2. For EN 62471 test report:

National Testing Center for Optical Radiation Safety of Photoelectric Products' photoelectric testing room.

3rd floor, No1 Quality Control Testing Building, No.2 Wenhua Road, Jiangbei Distict, Huizhou, Guangdong Province, China.

Summary of compliance with National Differences:

- See original report 50052581 001 for details.

Copy of marking plate:

- See original report 50052581 001 for details.

Test item particulars.....:	
Equipment mobility.....:	[] movable [] hand-held [] transportable [] stationary [x] for building-in [] direct plug-in
Connection to the mains.....:	[] pluggable equipment [] type A [] type B [] permanent connection [] detachable power supply cord [] non-detachable power supply cord [] not directly connected to the mains [x] built-in component, considered in end system
Operating condition.....:	[x] continuous [] rated operating / resting time:
Access location .....:	[] operator accessible [] restricted access location [x] built-in component, considered in end system
Over voltage category (OVC) .....:	[] OVC I [x] OVC II [] OVC III [] OVC IV [] other:
Mains supply tolerance (%) or absolute mains supply values .....:	±10% (requested by client)
Tested for IT power systems .....:	[x] Yes (only for Norway) [] No
IT testing, phase-phase voltage (V) .....:	230V (for Norway only)
Class of equipment .....:	[x] Class I [] Class II [] Class III [] Not classified
Considered current rating of protective device as part of the building installation (A) .....:	16A or 13A(UK only)
Pollution degree (PD) .....:	[] PD 1 [x] PD 2 [] PD 3
IP protection class .....:	IPX0
Altitude during operation (m) .....:	Up to 4000m
Altitude of test laboratory (m) .....:	Below 2000m
Mass of equipment (kg) .....:	Approx. 7.5Kg
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 .....:	See cover page
Date (s) of performance of tests.....:	See cover page
General remarks:	
"(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.**	

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:	
The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided ..... :	☐ **Yes** ☒ **Not applicable**
When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies) ..... :	**Huizhou Absen Optoelectronic Limited.** Donghua South Road 3rd, Dongjiang New Hi-tech Industrial Park, Huizhou. Guangdong, 526255 P.R. China

General product information:

Description of Change(s):

1. Add new model names M2.3, M3.4 for alternative use. Models M2.3, M3.4 and M2.9 are identical to each other except for the LED spacing and LED light used. See below table model difference for details.
2. Change the type LED light (type: FC-B1010RGBT-HG for model M2.3 and type: FM-B2020RGBA-HG for model M3.4) for alternative use, see appended table 1.5.1 for details.

the above described change the following was considered to be necessary:

Change	Testing	Comments
1	Clause 1.6.2, 4.5.2	See appended table 1.6.2 and 4.5 for details.
2	EN 62471 test report	See attachment 1 for details.

Model difference

Table A: N3 series model difference			
Model name	M2.9	M2.3	M3.4
LED spacing	2.97mm	2.31mm	3.47mm
LED light model	FM-B1515RGBA-HG	FC-B1010RGBT-HG	FM-B2020RGBA-HG

Note: This test report should be read in conjunction with the original report No.: 50052581 001, issued on 2016-08-29.

History of amendments and modifications:

Ref. No. 50052581 001, dated Aug. 29, 2016 (original test report)
Ref. No. 50052581 002, dated Nov. 07, 2016 (1st Modification)

Abbreviations used in the report:

- normal conditions	**N.C**.	- single fault conditions	**S.F.C**
- functional insulation	**OP**	- basic insulation	**BI**
- double insulation	**DI**	- supplementary insulation	**SI**
- between parts of opposite polarity	**BOP**	- reinforced insulation	**RI**

Indicate used abbreviations (if any)

IEC 60950-1			
Clause	Requirement + Test	Result - Remark	Verdict
1.6	**Power interface**		P
1.6.1	AC power distribution systems	TN power system	P
1.6.2	Input current	(see appended table 1.6.2)	P
1.6.3	Voltage limit of hand-held equipment	This appliance is not hand-held equipment.	N/A
1.6.4	Neutral conductor	The neutral conductor insulated from earth and from the body throughout the equipment as if it were a line conductor	P
4.3.13.5	Lasers (including laser diodes) and LEDs		P
4.3.13.5.1	Lasers (including laser diodes)	No laser.	N/A
	Laser class .....:		—
4.3.13.5.2	Light emitting diodes (LEDs)	Indicating LED on secondary is inherently exempt group according to IEC 62471.	—
4.3.13.6	Other types .....:	Considered	P
4.5	**Thermal requirements**		P
4.5.1	General	No exceeding temperature.	P
4.5.2	Temperature tests	(see appended table 4.5)	P
	Normal load condition per Annex L .....:	Equipment operated with maximum normal load.	—
4.5.3	Temperature limits for materials	(see appended table 4.5)	P
4.5.4	Touch temperature limits	(see appended table 4.5)	P

1.5.1	TABLE: List of critical components				P
Object/part No.	Manufacturer/ trademark	Type/model	Technical data	Standard (Edition / year)	Mark(s) of conformity[1])
LED light (For model M2.9)	FOSHAN NATIONSTAR OPTOELECTRONICS CO., LTD	FM-B1515RGBA-HG	2V, 8mA for Red LED; 3V, 5mA for Green LED， 3V, 3mA for Blue LED	EN 60950-1	Test with appliance
LED light (For model M2.3)	**FOSHAN NATIONSTAR OPTOELECTRONICS CO., LTD**	**FC-B1010RGBT-HG**	**2V, 5mA for Red LED; 2.6V, 2mA for Green LED， 2.7V, 2mA for Blue LED**	**EN 60950-1**	**Test with appliance**
LED light (For model M3.4)	**FOSHAN NATIONSTAR OPTOELECTRONICS CO., LTD**	**FM-B2020RGBA-HG**	**2V, 8mA for Red LED; 3V, 5mA for Green LED， 3V, 3mA for Blue LED**	**EN 60950-1**	**Test with appliance**

1.6.2	TABLE: Electrical data (in normal conditions)					P
U (V/Hz)	I (A)	Irated (A)	P (W)	Fuse #	Ifuse (A)	Condition/status
For model: M2.3						
90/50Hz	11. 93	--	1070.2	--	--	Normal load condition
90/60Hz	11.97	--	1073.5	--	--	Normal load condition
100/50Hz	11.82	12	1178.8	--	--	Normal load condition
100/60Hz	11.80	12	1178.2	--	--	Normal load condition
240/50Hz	11.06	12	2653.6	--	--	Normal load condition
240/60Hz	11.06	12	2623.5	--	--	Normal load condition
264/50Hz	11.03	--	2910.3	--	--	Normal load condition
264/60Hz	11.05	--	2910.7	--	--	Normal load condition
For model: M3.4						
90/50Hz	11. 96	--	1075.2	--	--	Normal load condition
90/60Hz	11.97	--	1074.5	--	--	Normal load condition
100/50Hz	11.87	12	1185.3	--	--	Normal load condition
100/60Hz	11.83	12	1182.9	--	--	Normal load condition
240/50Hz	11.03	12	2650.8	--	--	Normal load condition
240/60Hz	11.05	12	2651.1	--	--	Normal load condition
264/50Hz	10.96	--	2890.1	--	--	Normal load condition
264/60Hz	11. 96	--	2893.6	--	--	Normal load condition

Supplementary information:

Normal load condition: Full white screen, AC output connector load with 10.4A. The current of socket outlet is from AC mains directly but not switching power supply.

4.5	TABLE: Thermal requirements			
	Supply voltage (V) :	90V/60Hz	264V/60Hz	—
	Ambient T_{min} (°C) :	--	--	—
	Ambient T_{max} (°C) :	26.7	30.7	—
Maximum measured temperature T of part/at:		T (°C)		Allowed T_{max} (°C)
For model: M3.4				
Appliance inlet surface		47.5	49.8	70-(40-26.1)=56.1
Metal enclosure of switching power supply		71.5	73.2	90-(40-26.1)=76.1
Metal enclosure of power pack		50.6	52.9	70-(40-26.1)=56.1
AC inlet lead wire		51.9	53.2	105-(40-26.1)=91.1
PCB near U2		59.2	61.0	130-(40-26.1)=116.1
PCB near CC1		57.7	58.6	130-(40-26.1)=116.1
PCB near T1		57.4	58.8	130-(40-26.1)=116.1
PCB near U11		61.5	62.8	130-(40-26.1)=116.1
PCB near U20		62.9	64.3	130-(40-26.1)=116.1
C50 surface		59.6	61.3	105-(40-26.1)=91.1
PCB near U9		46.9	49.3	130-(40-26.1)=116.1
LED panel surface		51.2	51.1	90-(40-26.1)=76.1
Enclosure of LED panel		53.0	52.8	90-(40-26.1)=76.1
Metal Frame		38.1	37.7	70-(40-26.1)=56.1
Enclosure of LED panel (back)		46.2	45.6	90-(40-26.1)=76.1
PCB near U15		53.4	52.8	130-(40-26.1)=116.1
AC outlet lead wire		47.8	47.9	105-(40-26.1)=91.1
Ambient		26.1	26.1	--
For model: M2.3				
AC inlet lead wire		44.8	45.6	105-(40-25)=90
Metal enclosure of switching power supply		63.7	67.6	90-(40-25)=75
PCB near U2		57.9	58.4	130-(40-25)=115
PCB near CC1		65.8	66.1	130-(40-25)=115
PCB near T1		56.0	57.0	130-(40-25)=115
PCB near U11		61.8	63.0	130-(40-25)=115
PCB near U20		63.5	64.6	130-(40-25)=115
C50 surface		60.6	61.6	105-(40-25)=90
PCB near U9		47.3	50.0	130-(40-25)=115
Metal enclosure of power pack		46.9	49.9	70-(40-25)=55
LED panel surface		48.3	46.1	90-(40-25)=75
Enclosure of LED panel		48.8	45.4	90-(40-25)=80
Metal Frame		37.9	36.3	70-(40-25)=55

Enclosure of LED panel (back)	43.2	40.8	90-(40-25)=75
PCB near U15	55.7	53.5	130-(40-25)=115
AC outlet lead wire	42.9	43.4	105-(40-25)=90
Ambient	25.0	25.0	--

Temperature T of winding:	t_1 (°C)	R_1 (Ω)	t_2 (°C)	R_2 (Ω)	T (°C)	Allowed T_{max} (°C)	Insulation class
--	--	--	--	--	--	--	--

Supplementary information:

The temperatures were measured under worst case normal mode defined in 1.2.2.1 and as described in sub-clause 1.6.2 and at voltages as described above.

With a rated maximum ambient temperature of 40°C.

IEC 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 cd·m^{-2}		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 J·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
	$E_s \cdot t = \sum_{200}^{400} \sum_{t} E_\lambda(\lambda,t) \cdot S_{UV}(\lambda) \cdot \Delta t \cdot \Delta\lambda \le 30$ J·m^{-2}		P
	The permissible time for exposure to ultraviolet radiation incident upon the unprotected eye or skin shall be computed by:		P
	$t_{max} = \frac{30}{E_s}$ 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 J·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 W·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
	$t_{max} \le \frac{10\,000}{E_{UVA}}$ s		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(λ), i.e., the blue-light weighted radiance , L_B, shall not exceed the levels defined by:		P

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict
	$L_B \cdot t = \sum_{300}^{700} \sum_{t} L_\lambda(\lambda,t) \cdot B(\lambda) \cdot \Delta t \cdot \Delta\lambda \le 10^6$ J · m^{-2} · sr^{-1}	for t ≤ 10^4 s $t_{max} = \frac{10^6}{L_B}$	P
	$L_B = \sum_{300}^{700} L_\lambda \cdot B(\lambda) \cdot \Delta\lambda \le 100$ W · m^{-2} · sr^{-1}	for t > 10^4 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(λ) shall not exceed the levels defined by:		N/A
	$E_B \cdot t = \sum_{300}^{700} \sum_{t} E_\lambda(\lambda,t) \cdot B(\lambda) \cdot \Delta t \cdot \Delta\lambda \le 100$ J · m^{-2}		N/A
	$E_B = \sum_{300}^{700} E_\lambda \cdot B(\lambda) \cdot \Delta\lambda \le 1$ W · m^{-2}		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(λ) (from Figure 4.2 and Table 4.2), i.e., the burn hazard weighted radiance, shall not exceed the levels defined by:		P
	$L_R = \sum_{380}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \le \frac{50\,000}{\alpha \cdot t^{0,25}}$ W · m^{-2} · sr^{-1}	(10 µs ≤ t ≤ 10 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
	$L_{IR} = \sum_{780}^{1400} L_\lambda \cdot R(\lambda) \cdot \Delta\lambda \le \frac{6\,000}{\alpha}$ W · m^{-2} · sr^{-1}	t > 10 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
	$E_{IR} = \sum_{780}^{3\,000} E_\lambda \cdot \Delta\lambda \le 18\,000 \cdot t^{-0,75}$ W · m^{-2}	t ≤ 1000 s	P
	For times greater than 1000 s the limit becomes:		P

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict
	$E_{IR} = \sum_{780}^{3\,000} E_\lambda \cdot \Delta\lambda \le 100 \qquad W \cdot m^{-2}$	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
	$E_H \cdot t = \sum_{380}^{3\,000} \sum_{t} E_\lambda(\lambda,t) \cdot \Delta t \cdot \Delta\lambda \le 20\,000 \cdot t^{0,25} \qquad J \cdot m^{-2}$		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.		P
5.1.1	Lamp ageing (seasoning)		N/A
	Seasoning of lamps shall be done as stated in the appropriate IEC lamp standard.		N/A
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.	Temperature maintained at 25 ±1°C, Relative humidity shall be maintained to less than 65%; Airflow shall be minimized when measuring	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

	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		N/A
	The measurements made with an optical system.		N/A
	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.		N/A
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	Continuous wave lamps	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.		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.	see Annex C in the norm	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

	– 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	r=0.2m	P
6.1	Continuous wave lamps		P
6.1.1	Except 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/A
	In this group are lamps, which exceeds the limits for the except group but that does not pose:		N/A
	– an actinic ultraviolet hazard (E_S) within 10000 s, nor		N/A
	– a near ultraviolet hazard (E_{UVA}) within 300 s, nor		N/A
	– a retinal blue-light hazard (L_B) within 100 s, 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 100 s		N/A
	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.		N/A
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_S) 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
	– 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 near-infrared retinal hazard (L_{IR}), 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.	Continuous wave lamps	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 (High-Risk)		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

Table 4.1	Spectral weighting function for assessing ultraviolet hazards for skin and eye	P

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.

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict

Table 4.2	Spectral weighting functions for assessing retinal hazards from broadband optical sources	P

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	$10^{[(450-\lambda)/50]}$	1,0
600-700	0,001	1,0
700-1050		$10^{[(700-\lambda)/500]}$
1050-1150		0,2
1150-1200		$0,2 \times 10^{0.02(1150-\lambda)}$

IEC 62471			
Clause	Requirement + Test	Result – Remark	Verdict

Table 4.2	Spectral weighting functions for assessing retinal hazards from broadband optical sources		P
1200-1400		0,02	

Table 5.4	Summary of the ELs for the surface of the skin or cornea (irradiance based values)				P
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)				P
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/α

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Clause	Requirement + Test	Result – Remark	Verdict

Table 6.1	Emission limits for risk groups of continuous wave lamps									N/A
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	--	0,03	--	
Near UV	--	E_{UVA}	$W \cdot m^{-2}$	10	--	33	--	100	--	
Blue light	B(λ)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	--	10000	--	4000000		
Blue light, small source	B(λ)	E_B	$W \cdot m^{-2}$	0.01*	--	1,0	--	400	--	
Retinal thermal	R(λ)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α	--	28000/α	--	71000/α	--	
Retinal thermal, weak visual stimulus**	R(λ)	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	--	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										

Annex 1: European group differences and national differences.

ATTACHMENT TO TEST REPORT IEC 62471
EUROPEAN GROUP DIFFERENCES AND NATIONAL DIFFERENCES
Photobiological safety of lamps and lamps systems

Differences according to.....: EN 62471:2008

Attachment Form No.....: EU_GD_IEC62471A

Attachment Originator .....: IMQ S.p.A.

Master Attachment.....: 2009-07

	CENELEC COMMON MODIFICATIONS (EN)		P
4	**EXPOSURE LIMITS**		P
	Contents of the whole Clause 4 of IEC 62471:2006 moved into a new informative Annex ZB		—
	Clause 4 replaced by the following:		P
	Limits of the Artificial Optical Radiation Directive (2006/25/EC) have been applied instead of those fixed in IEC 62471:2006	See appended Table 6.1	P
4.1	General		P
	First paragraph deleted		—

Table 6.1	Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC)									P
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	7.045E-05	0,003	--	--	--	
Near UV		E_{UVA}	$W \cdot m^{-2}$	0.33	1.586E-05	33	--	--	--	
Blue light	B(λ)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	1.520E+00	10000	--	4000000	--	
Blue light, small source	B(λ)	E_B	$W \cdot m^{-2}$	0,01	--	1,0	--	400	--	
Retinal thermal	R(λ)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α	5.524E+01	28000/α	--	71000/α	--	
Retinal thermal, weak visual stimulus**	R(λ)	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	545000 0,0017≤ α ≤ 0,011	--	--	--	--	--	
				6000/α 0,011≤ α ≤ 0,1	4.482E-04	--	--	--	--	
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	5.615E-04	570	0.0e+00	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

Test under white colour for model M2.3.

NOTE The action functions: see Table 4.1 and Table 4.2
The applicable aperture diameters: see 4.2.1
The limitations for the angular subtenses: see 4.2.2
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

Table 6.1	Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC)									N/A
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	7.294E-06	--	--	--	--	
Near UV		E_{UVA}	$W \cdot m^{-2}$	0,33	2.069E-03	--	--	--	--	
Blue light	B(λ)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	4.714E-03	10000	--	4000000	--	
Blue light, small source	B(λ)	E_B	$W \cdot m^{-2}$	0,01*	--	1,0	--	400	--	
Retinal thermal	R(λ)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α	8.914E+00	28000/α	--	71000/α	--	
Retinal thermal, weak visual stimulus**	R(λ)	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	545000 0,0017≤ α ≤ 0,011	--	--	--	--	--	
				6000/α 0,011≤ α ≤ 0,1	2.414E-03	--	--	--	--	
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	2.878E-03	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

Test under red colour for model M2.3.

NOTE The action functions: see Table 4.1 and Table 4.2
The applicable aperture diameters: see 4.2.1
The limitations for the angular subtenses: see 4.2.2
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

Table 6.1	Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC)									N/A
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	5.174E-05	0,003	--	--	--	
Near UV		E_{UVA}	$W \cdot m^{-2}$	0,33	1.326E-05	33	--	--	--	
Blue light	B(λ)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	7.878E-02	10000	--	4000000	--	
Blue light, small source	B(λ)	E_B	$W \cdot m^{-2}$	0,01*	--	1,0	--	400	--	
Retinal thermal	R(λ)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α	6.294E+00	28000/α	--	71000/α	--	
Retinal thermal, weak visual stimulus**	R(λ)	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	545000 0,0017≤ α ≤ 0,011	--	--	--	--	--	
				6000/α 0,011≤ α ≤ 0,1	1.732E-03	--	--	--	--	
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	7.730E-05	570	0.0e+00	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

Test under green colour for model M2.3.

NOTE The action functions: see Table 4.1 and Table 4.2
The applicable aperture diameters: see 4.2.1
The limitations for the angular subtenses: see 4.2.2
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

Table 6.1	Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC)									N/A
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	1.232E-09	0,003	--	--	--	
Near UV		E_{UVA}	$W \cdot m^{-2}$	0,33	1.132E-05	33	--	--	--	
Blue light	B(λ)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	1.653E+00	10000	--	4000000	--	
Blue light, small source	B(λ)	E_B	$W \cdot m^{-2}$	0,01*	--	1,0	--	400	--	
Retinal thermal	R(λ)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α	3.771E+01	28000/α	--	71000/α	--	
Retinal thermal, weak visual stimulus**	R(λ)	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	545000 0,0017≤ α ≤ 0,011	--	--	--	--	--	
				6000/α 0,011≤ α ≤ 0,1	1.342E-03	--	--	--	--	
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	2.769E-05	570	0.0e+00	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

Test under blue colour for model M2.3.

NOTE The action functions: see Table 4.1 and Table 4.2
The applicable aperture diameters: see 4.2.1
The limitations for the angular subtenses: see 4.2.2
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

Table 6.1	Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC)								P
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	4.593E-05	0,003	--	--	--
Near UV		E_{UVA}	$W \cdot m^{-2}$	0.33	1.120E-05	33	--	--	--
Blue light	B(λ)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	1.567E+00	10000	--	4000000	--
Blue light, small source	B(λ)	E_B	$W \cdot m^{-2}$	0,01	--	1,0	--	400	--
Retinal thermal	R(λ)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α	4.014E+01	28000/α	--	71000/α	--
Retinal thermal, weak visual stimulus**	R(λ)	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	545000 0,0017≤ α ≤ 0,011	--				
				6000/α 0,011≤ α ≤ 0,1	--				
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	4.390E-04	570	0.0e+00	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

Test under white colour for model M3.4.

NOTE The action functions: see Table 4.1 and Table 4.2
The applicable aperture diameters: see 4.2.1
The limitations for the angular subtenses: see 4.2.2
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

Table 6.1	Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC)									N/A
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	2.740E-05	--	--	--	--	
Near UV		E_{UVA}	$W \cdot m^{-2}$	0,33	3.013E-06	--	--	--	--	
Blue light	B(λ)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	4.008E-03	10000	--	4000000	--	
Blue light, small source	B(λ)	E_B	$W \cdot m^{-2}$	0,01*	--	1,0	--	400	--	
Retinal thermal	R(λ)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α	4.153E+00	28000/α	--	71000/α	--	
Retinal thermal, weak visual stimulus**	R(λ)	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	545000 0,0017≤ α ≤ 0,011	--					
				6000/α 0,011≤ α ≤ 0,1	--					
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	3.455E-04	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

Test under red colour for model M3.4.

NOTE The action functions: see Table 4.1 and Table 4.2
The applicable aperture diameters: see 4.2.1
The limitations for the angular subtenses: see 4.2.2
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

Table 6.1	Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC)									N/A
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	1.911E-10	0,003	--	--	--	
Near UV		E_{UVA}	$W \cdot m^{-2}$	0,33	1.145E-06	33	--	--	--	
Blue light	B(λ)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	8.022E-02	10000	--	4000000	--	
Blue light, small source	B(λ)	E_B	$W \cdot m^{-2}$	0,01*	--	1,0	--	400	--	
Retinal thermal	R(λ)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α	4.034E+00	28000/α	--	71000/α	--	
Retinal thermal, weak visual stimulus**	R(λ)	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	545000 0,0017≤ α ≤ 0,011	--	--	--	--	--	
				6000/α 0,011≤ α ≤ 0,1	3.885E-04	--	--	--	--	
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	3.779E-05	570	0.0e+00	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

Test under green colour for model M3.4.

NOTE The action functions: see Table 4.1 and Table 4.2
The applicable aperture diameters: see 4.2.1
The limitations for the angular subtenses: see 4.2.2
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

Table 6.1	Emission limits for risk groups of continuous wave lamps (based on EU Directive 2006/25/EC)									N/A
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	2.025E-10	0,003	--	--	--	
Near UV		E_{UVA}	$W \cdot m^{-2}$	0,33	6.184E-06	33	--	--	--	
Blue light	B(λ)	L_B	$W \cdot m^{-2} \cdot sr^{-1}$	100	1.506E+00	10000	--	4000000	--	
Blue light, small source	B(λ)	E_B	$W \cdot m^{-2}$	0,01*	--	1,0	--	400	--	
Retinal thermal	R(λ)	L_R	$W \cdot m^{-2} \cdot sr^{-1}$	28000/α	2.369E+01	28000/α	--	71000/α	--	
Retinal thermal, weak visual stimulus**	R(λ)	L_{IR}	$W \cdot m^{-2} \cdot sr^{-1}$	545000 0,0017≤ α ≤ 0,011	--	--	--	--	--	
				6000/α 0,011≤ α ≤ 0,1	5.626E-04	--	--	--	--	
IR radiation, eye		E_{IR}	$W \cdot m^{-2}$	100	9.511E-06	570	0.0e+00	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

Test under blue colour for model M3.4.

NOTE The action functions: see Table 4.1 and Table 4.2
The applicable aperture diameters: see 4.2.1
The limitations for the angular subtenses: see 4.2.2
The related measurement condition 5.2.3 and the range of acceptance angles: see Table 5.5.

Attachment 3

TÜVRheinland®

EMF Assessment report

Applicant: Shenzhen Absen Optoelectronic Co., Ltd.

18-20/F, Tower A, Building 3, Phase I, Tian An Cloud Park, NO.2018, Xuegang Rd, Bantian, Longgang Dsitrict, Shenzhen, Guangdong, P.R China

Product name: FULL COLOR LED DISPLAY

Model name: M2.3, M3.4, M2.9

Test report No.: 50052581 002

The equipment is a Low Voltage Full Color LED Display it does incorporate only non-intentional radiators, but does not contain radio transmitters; the typical usage, installation and physical characteristics make the equipment inherently compliant with all applicable EMF exposure levels (EN 62479:2010 clause 4.1 Route A).

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