

**CENTRAAL LABORATORIUM VOOR ELEKTRICITEIT (C.L.E.)
LABORATOIRE CENTRAL D'ELECTRICITE (L.C.E.)**

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Photometry and lighting fixtures

REPORT OF TEST / MEASUREMENT

Purpose of the test / measurement	Photobiological safety of an inset taxiway centreline LED light with blue LED according to IEC 62471
Delivered to	ADB Leuvensesteenweg, 585 1930 ZAVENTEM Belgium E-mail : alain.mortier@adb-air.com
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This report concerns type tests on one or a serie of specimens (delivered by the client) or a measurement campaign.

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A. Specifications of the device under test



Product/Device name : Inset taxiway centreline LED light with blue LED
Manufacturer : ADB
Type : DTSA2BN0A00001
Serial number : 000001 2014/29
Samples Date of entrance : 27/06/2014
 Number of samples : 1
 CLE Number : 14EG0360 B

FIXTURE driving current 6600 mA :

Description:

Apparent dimensions (A x B) of the luminous area: 35mm x 10 mm
Mean dimension ($Z = (A + B)/2$) : 22,5 mm

IEC 62471 defines the angular dimension in radian of the device as mean dimension (Z) divided by the measurement distance. This angular dimension is used to determine the test to be carried out and some applicable limits.

Lamp/Source	 
Auxiliary	 

B. Test program

Program

Spectral radiance and irradiance measurements of the device under test in the following wavelength ranges:

- 200 to 400 nm : « Actinic UV skin & eye » irradiance
- 315 to 400 nm : « Eye UV-A » irradiance
- 300 to 700 nm : « Blue Light » radiance
- 380 to 1100 nm: « Thermal Retinal » radiance

Determination of the Risk Group classification for each hazard and recommendation about the marking of the product.

Reference documents

- CIE 63 The spectroradiometric measurement of light sources
- IEC 62471-1 Photobiological safety of lamps and lamp systems (CIE S009)
- IEC 62471-2 Photobiological safety of lamps and lamp systems – Part 2: Guidance on manufacturing requirements relating to non-laser optical radiation safety
- IES LM79 Electrical and Photometric measurement of solid-state lighting Products

C. Method

According to IES LM79, LED products shall be tested with no seasoning (aging).

On the photometrical bench, measurement of the absolute spectral irradiance and radiance with a double monochromator is carried out. The measurement device is calibrated before the measurement with a calibrated deuterium standard lamp (PTB traceability) and a calibrated halogen standard lamp (NPL traceability).

The irradiance and radiance measurements are reported at a distance of 20 cm.

If needed, distance is increased to reach the RG2/RG1 distance.

Each measurement is carried out after the thermal stabilization of the lamp (minimum 30 minutes).

Ambient temperature: $25 \pm 1^{\circ}\text{C}$

Stabilized voltage supply: 230,0 Vac 50 Hz

Position of the device under test: horizontal

D. Results

The following measurements have been performed on the device under test:

Electrical characteristics:

Driver position 5
Voltage: 3,5 V
FIXTURE driving current: 6600 mA*

* value displayed on the auxiliary

Risk Group for a distance of 200 mm:

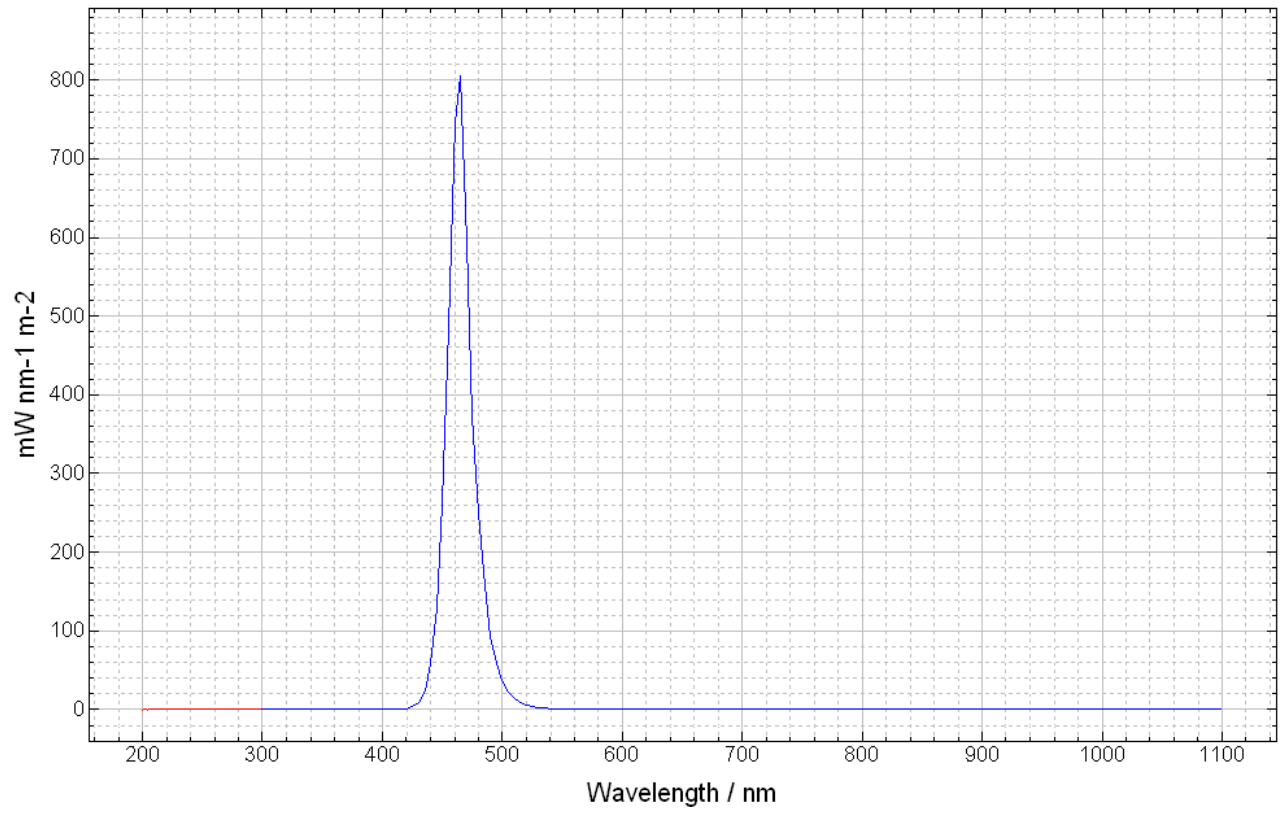
Angular dimension (Z / 200): 0,062 radian

Hazard Name	Action spectrum	Unit	Wavelength range (nm)	Field of view (mrad)	Measurement	Risk Group
Irradiance Actinic UV skin & eye	S(λ)	<i>mW m⁻²</i>	200 - 400	-	0	Risk Group 0
Irradiance Eye UVA	-	<i>mW m⁻²</i>	315 - 400	-	0	Risk Group 0
Radiance Blue Light	B(λ)	<i>W m⁻² sr⁻¹</i>	300 - 700	100	14266	Risk Group 2
				11	14494	
				1,7	20973	
Radiance Retinal Thermal	R(λ)	<i>W m⁻² sr⁻¹</i>	380 – 1100 ⁽¹⁾	11	145075	Risk Group 0

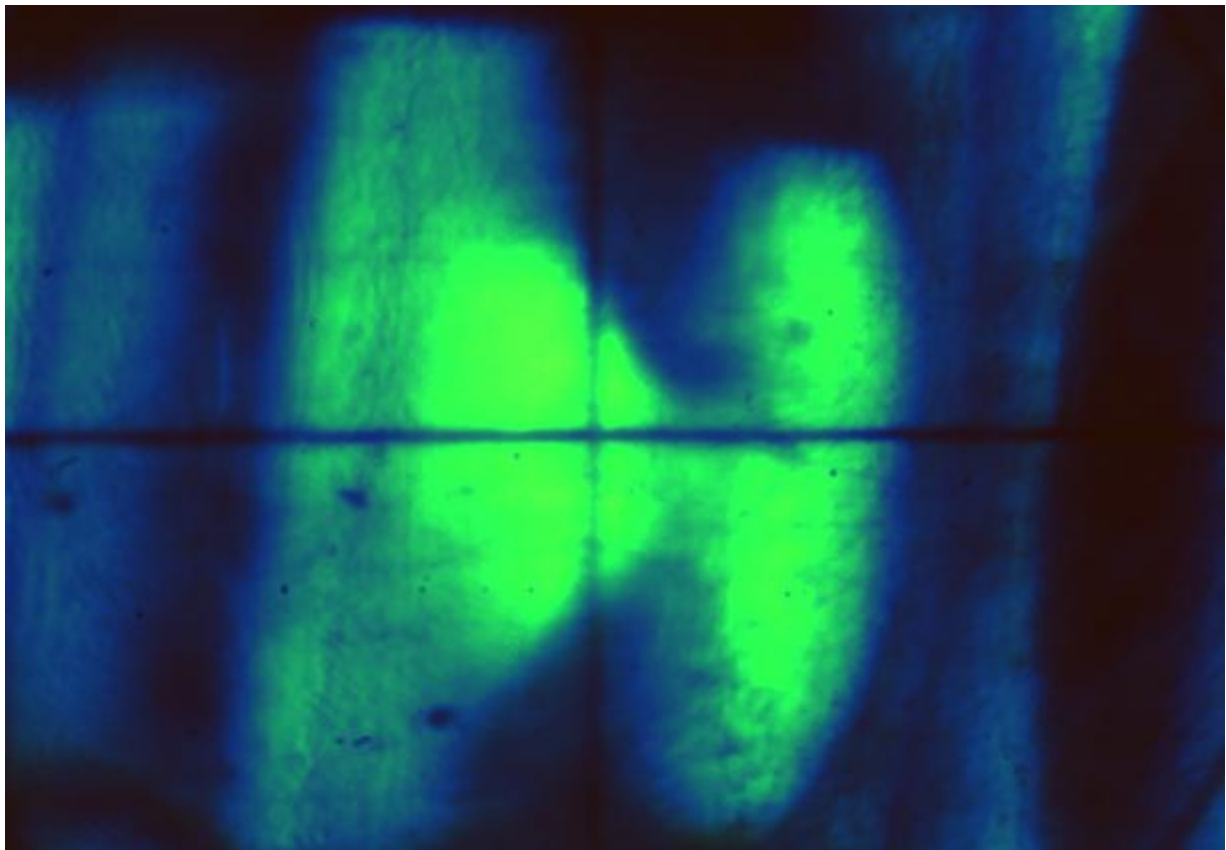
Notes:

- (1) according to the standard, "Radiance Retinal Thermal" hazard has to be assessed between 380 nm and 1400 nm. As LEDs don't emit between 1000 nm and 1400 nm, this hazard is only assessed between 380 nm and 1100 nm.
- (2) For information, the limits of the different risk group are presented in appendix

Irradiance between 200nm and 1100 nm



Field of view for the radiance measurement (at distance of 150 cm)



Determination of the distance for RG1 blue light hazard

Following the results of previous section, the spot has been assessed as Risk Group 2.

Document IEC/TR 62778:2012 brings clarification and guidance concerning the assessment of blue light hazard of all lighting products which have the main emission in the visible spectrum (380 nm to 780 nm). **Within it, it is proposed to determine, for luminaire obtaining a Risk Group 2 classification for blue light hazard, the distance at which the luminaire will be Risk Group 1.**

For a lamp such as the lamp concerned by this test, average luminance for a fixed opening angle is decreased by rising the distance. Taking into account the uncertainty measurement and the limit of $10000 \text{ W m}^{-2} \text{ sr}^{-1}$, **the distance at which the lamp reached Risk Group 1 has been determined to be 45 cm**

E. Conclusion

According to the measurements, the following Risk Group can be calculated for each hazard and measurement distance. The measurement distance has a impact on the Risk Group classification. According to IEC 62471, the values shall be reported as follow:

- For lamps intended for general lighting service (GLS*), the hazard values shall be reported as either irradiance or radiance values at a distance which produces an illuminance of 500 lux, but not less than 200mm;
- For all other light sources, including pulsed lamp sources, the hazard values shall be reported at a distance of 200mm.

** GLS : Term for lamps intended for lighting spaces that are typically occupied or viewed by people. Examples would be lamps for lighting offices, school, home, factories, roadways or automobiles. It does not include lamps for such uses as film projection, reprographic processes, suntanning, industrial processes, medical treatment and searchlight application.*

This clause is concerned with lamp classification. However a similar classification system could be applicable to luminaires or other containing operating lamps.

In some cases, the same lamp may be used in both GLS and special applications. In such cases, this lamp should be evaluated for intended applications. In this report, the results are expressed for non-GLS application.

Risk Group for a distance of 200 mm, for non-GLS source:

Hazard Name	Risk Group
Irradiance Actinic UV skin & eye	Risk Group 0 (Exempt)
Irradiance Eye UVA	Risk Group 0 (Exempt)
Radiance Blue Light	Risk Group 2 (Moderate)
Radiance Retinal Thermal	Risk Group 0 (Exempt)

According to IEC 62471-2, the following marking should be marked on the product:

RISK GROUP 2
CAUTION Possibly hazardous optical radiation emitted from this product. Do not stare at operating lamp. May be harmful to the eyes.

Labels on the housing should be permanently fixed, legible, and clearly visible during maintenance and service. They should be positioned so that they can be read without the necessity for human exposure to optical radiation in excess of the applicable ELVs. Text and borders should be black on a yellow background. The label size should be adapted to the size of the product. Reproductions of all required labels should be included in the user manual.

For viewing distances superior to 45mm (0,45 m), the lamp will be Risk Group 1 or lower for blue light hazard.

Appendix 1 : limits of the different risk group at 200mm

				Limite			Limite			Limite						
				temps expo	Ouverture	limite d'expo				temps expo	Ouverture	limite d'expo				
				s	rad	mW m-2				s	rad	mW m-2				
Es	Ultraviolet actinique	Actinic S(λ)	[200-400]	RG0	30000	1,4	1	RG1	10000	1,4	3	RG2	1000	1,4	30	RG3
Euva	Risque du proche	-	[315-400]		1000	1,4	10000		300	1,4	33333		100	1,4	100000	
				temps expo	Champ de vision	limite d'expo				temps expo	Champ de vision	limite d'expo				
				s	rad	W m-2 sr-1				s	rad	W m-2 sr-1				
Lb	Lumière bleue	Blue Light B(λ)	[300-700]	RG0	10000	0,1	100	RG1	100	0,011	10000	RG2	0,25	0,0017	4000000	RG3
Lr	Thermique rétinien	BurnHazard R(λ)	[380-1400]		10	0,011	452889		10	0,011	452889		0,25	0,0017	1138955,386	

End of the report