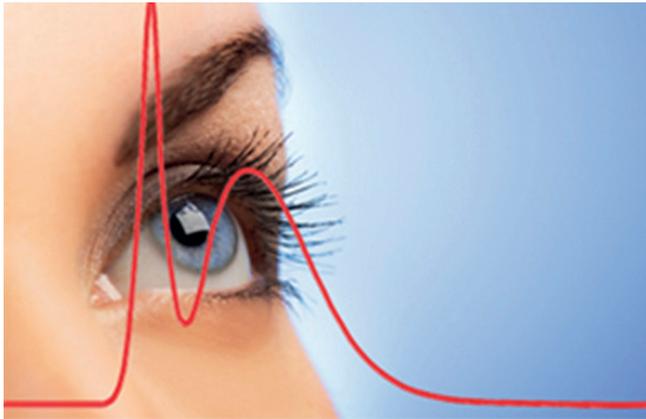


Photobiological testing of lamps IEC 62471 and IEC 62778



The publication in 2006 of IEC 62471:2006 “Photobiological Safety of Lamps and Lamp Systems”, heralded a new framework for the evaluation of the photobiological safety of non-laser electrically-powered products emitting light in the spectral region 200-3000 nm.

Adopted by many countries throughout the world as voluntary standards, in Europe, this standard was published as EN 62471:2008 and harmonised to the low voltage directive, 2006/95/EC.

Due to issues caused in implementing this standard for lighting products, the IEC published in 2012 a non-normative technical report IEC TR 62778, “Application of IEC 62471 for the assessment of blue light hazard to light sources and luminaires” and subsequently amended a range of normative lamp and luminaire vertical standards, harmonised to the low voltage directive, to make reference to this technical report, obviating the need for implementation of IEC 62471 save in those cases where UV or IR emission should be considered. The measurement burden of IEC TR 62778 is therefore less than that of IEC 62471.

Faced with a complex series of measurements of spectral irradiance and spectral radiance over wide spectral range, and in response to the recommended measurement instrumentation of IEC 62471 (notably the use of a double monochromator to provide excellent stray light rejection and high spectral resolution wide spectral range), Bentham has configured the IDR300-PSL measurement system.

Incorporating products from the long-established Bentham spectroradiometer and accessories portfolio, with the introduction of new products designed to meet the specific requirements of these measurements, the IDR300-PSL system provides an automated measurement solution with full software guidance, calculation and classification.

Skin or cornea hazard		
Actinic UV skin & eye	ES	200-400 nm
Eye UV-A	EUVA	315-400 nm
Blue light small source	EB	300-700 nm
Eye IR	EIR	780-3000 nm
Skin thermal	EH	380-3000 nm
Retinal hazard		
Blue light	LB	300-700 nm
Retinal thermal	LR	380-1400 nm
Retinal thermal (weak)	LIR	780-1400 nm

In consideration of six hazards to the skin and eye, measurements of spectral irradiance are performed over the range 200-3000 nm and spectral radiance 300-1400 nm.

At the heart of the system is the IDR300 integrated double spectroradiometer combining:

- Flexibility of turret-mounted diffraction gratings for uninterrupted measurement over a wide spectral range
- Motorised slits to vary instrument bandwidth over the measurement range
- Stray light performance of a double monochromator, a key factor in the UV region
- Integrated DC electronics
- 3 detector ports
- Fully computer-controlled through Windows application, BenWin+
- USB interface



According to the measured quantity, the appropriate input optic should be used to define the geometry of measurement from which light is coupled into the spectroradiometer.

Photobiological testing of lamps IEC 62471 and IEC 62778

Spectral irradiance



To measure spectral irradiance, we require an input optic to measure light arriving from the entire hemisphere above the measurement plane. The D7 diffuser, having the exceptionally low cosine error of $f_2 < 1\%$, accurately measures this quantity over the range 200-1100 nm.

When measuring blue light radiance exempt risk group (in 100 mrad FOV) and retinal thermal weak visual stimulus exempt risk group (in 35 mrad FOV), the problem can arise of having to place apertures at the source, the size of the aperture required depending of course on the size of the luminous area.

To cater for this eventuality, we also offer the DIFF_D7_FOVL (Field of view limiter), a baffle tube which is simply mounted to the D7 diffuser, at the opposite end of which one can screw-on one of two apertures, to set 100 mrad or 35 mrad FOV. The length of the tube is set such that the distance between source and the front plane of the diffuser is the 200 mm non-GLS measurement distance. The baffle tube can be mounted in a number of ways, including on an optical post, tripod or lab jack. All that is required is to scan this optic over the surface of the DUT and use the alignment utility to find maximum signal.

Spectral radiance



To measure spectral radiance, we require an input optic to measure in a given field of view to mimic the imaging function of the human eye. According to the standard, there are three key fields of view, two of which are measured with the TEL309 telescope.

In order to achieve both given field of view and use over the range 200 mm to several metres, the TEL309 consists of a motorised relay optic and wheel of apertures with a USB camera viewer for the user to view the FOV.

Accompanying the system is a set of 3 calibration standards, with calibration traceable to NPL, UK, to provide the user with a traceable calibration chain, an important aspect of consideration in accreditation. Guidance is also provided in the determination of source subtense, required in the evaluation of the retinal hazards.

This system is also capable of performing measurements required for the implementation of IEC TR 62778. Where application of IEC TR 62778 alone is sought, a reduced system is available.