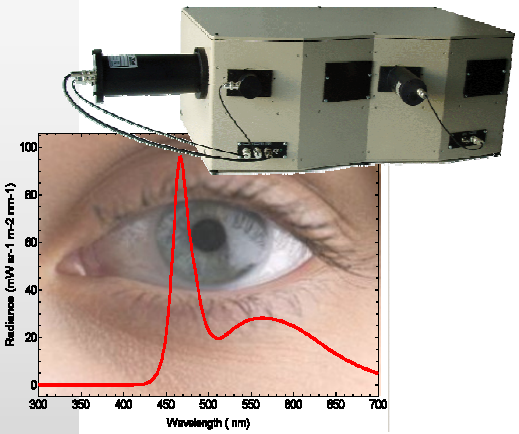
IDR300-PSL *Evaluation of the Photobiological Safety of Lamps*

EN62471/IEC62471/ ANSI /IESNA RP-27.1



The recent introduction of standards concerned with the photobiological safety of non-laser sources. represents a significant additional consideration in taking products to market. Whilst standards vary between countries, they stem from the same source and show a high degree of commonality to the international standard IEC62471:2006.

Therein is considered six potential hazards to the skin and eye of electrically-powered sources emitting light in the spectral region 200-3000nm, evaluated by a complex set of measurements of spectral irradiance and radi-

In response to the recommended instrumentation requirements of standards for the evaluation of the photobiological safety of lamps and lamps systems, Bentham have introduced the IDR300-PSL system having the following key attributes:-

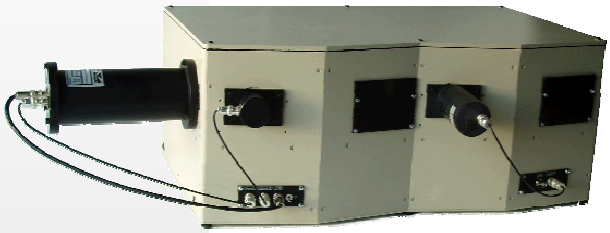
- Double monochromator for excellent stray light performance
- Wide spectral range of operation (200-3000nm)
- High spectral resolution
- Motorised slits to vary instrument bandwidth
- Integrated DC detection electronics
- Irradiance and radiance input optics adapted to requirements of standard
- Fully automated spectroradiometer with USB interface
- NPL traceable calibration standards
- Benwin+ Windows spectroradiometer software
- PSL wizard guides user through measurements, performs calculations, classifications and provides labelling information

Hazard	Wavelength Range (nm)	Quantity	Input Optic
Actinic UV skin and eye	200-400 *	Irradiance	D7
UVA eye	315-400	Irradiance	D7
Retinal Blue-light	300-700*	Radiance	TEL309
Retinal Blue-light- small source	300-700*	Irradiance	D7
Retinal thermal	380-1400*	Radiance	TEL309
Retinal thermal- weak visual	780-1400*	Radiance	TEL309
Infrared radiation eye	780-3000	Irradiance	D7, D8
Thermal skin	380-3000	Irradiance	D7, D8

***Weighted against action spectrum**

Photobiological Safety of Lamps

System Components- Integrated Double Spectroradiometer



The IDR300, based on the popular DTMc300 monochromator, integrates motorised entrance and exit slits and integrated DC detection electronics to provide a turnkey, 200-1700nm spectroradiometer. Addition of external AC detection electronics and a lead sulphide detector extends this capability to 3000nm.

The IDR300 operates as two single monochromators working in tandem with additive dispersion to provide a 600mm focal length double monochromator.

In each component single monochromator a stepping-motor driven grating turret with capacity for up to three diffraction gratings permits measurement over wide spectral range in a single scan. Motorised entrance and exit slits maintain chosen bandwidth throughout the scan range.

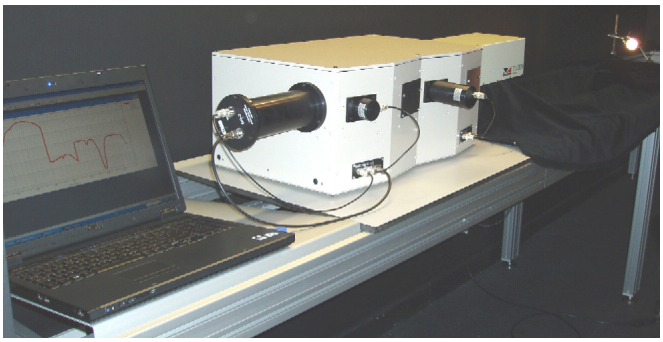
With two detector ports for the double configuration, a single for the single configuration, automated swing away mirror selection of detector ports and integrated DC electronics, the IDR300 constitutes an integrated measurement solution in the range 200-1700nm.

Range (nm)	Bandwidth (FWHM, nm)
200-400	<4
400-600	<8
600-1400	<20
>1400	No limitation

IEC62471:2006 Recommended Bandwidths

Range (nm)	Wavelength Accuracy (nm)
200-300	0.2
300-325	0.1
325-600	0.2
600-1400	2

IEC62471:2006 Recommended Wavelength Accuracy



Core Features

- 600mm focal length double monochromator 200-1100nm
- 300mm single monochromator >1100nm
- Motorised entrance and exit slits to set instrument bandwidth
- Three detector ports with integrated DC detection electronics
- Two dual channel transimpedance amplifiers with ADC
- Fully automated control via windows application
- Multi-alkali photomultipler, Silicon and InGaAs detectors
- Perform measurements of varying measurement step throughout scan
- Entirely automated with USB interface
- With the correct input optics can be adapted to a wide range of measurements

Photobiological Safety of Lamps

System Components

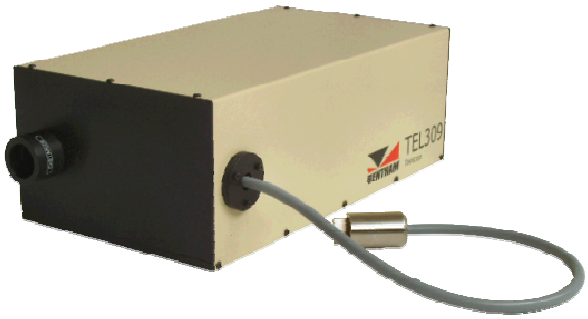
Photobiological Safety of Lamps

Input Optics

For the measurement of spectral irradiance, Bentham understand the necessity of input optics with correct angular response and high throughput.

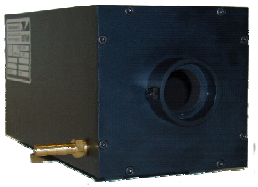
The D7 diffuser is calibrated to have near perfect match to the cosine response (f2<1%) and high throughput, and is coupled to the entrance slit of the IDR300-PSL by quartz fibre bundle (typically 1-2m long).

Designed in accordance with the requirements of the IEC62471:2006, the TEL309 is a computer-controlled direct-view telescope, with stepping-motor driven focusing and aperture selection, permitting the measurement of radiance, over defined fields of view relevant to these standard (11 and 1.7mrad), for measurement distances from 200mm to 50m.



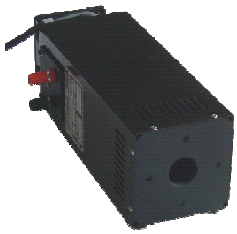
A USB camera-based viewer shows the user the measurement scene; the area of measurement is coupled to the IDR300-PSL via a quartz fibre bundle.

Calibration Standards– supplied with calibrations traceable to NPL, UK



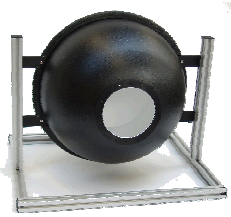
CL7-H Standard (Spectral Irradiance)

- 30W Deuterium lamp
- Enclosed housing
- Supplied with diffuser adaptor
- Operated by 705 power supply



CL6-H Standard (Spectral Irradiance)

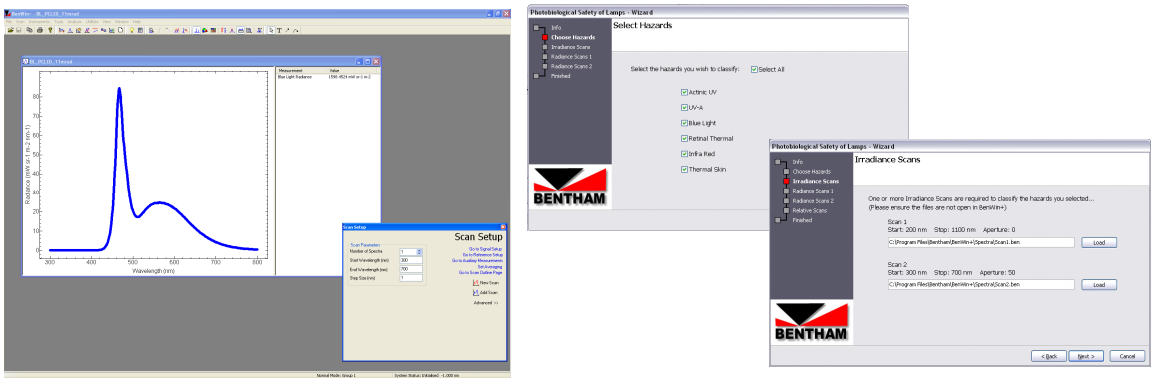
- 150W quartz halogen lamp
- Enclosed housing
- Supplied with diffuser adaptor
- Operated by 605 constant current supply



SRS12 Standard (Spectral Radiance)

- Baffled 100W quartz halogen lamp
- Ba_2SO_4 coated sphere
- Uniform illumination over 100mm port
- 12” sphere diameter
- Operated by 605 constant current supply

Software



- Fully automated windows spectroradiometer control software, Benwin+
- PSL Wizard guides user through measurement, performs calculations, classification and provides labelling information

System Specifications

Monochromator– IDR300			
Monochromator configuration:		Symmetric, single Czerny-Turner	
Monochromator focal length:		Single- 300mm; double 600mm	
Bandwidth:		Software controlled motorised slit	
Number of gratings:		1-3 mounted on turret	
Resolution:		**Single**	**Double**
	2400g/mm	-	0.075nm
	1200g/mm	0.3nm	0.15nm
	400g/mm	0.9nm	0.45nm
Dispersion:		**Single**	**Double**
	2400g/mm	-	0.68nm/mm
	1200g/mm	2.7nm/mm	1.35nm/mm
	400g/mm	8.1nm/mm	4.05nm/mm
Wavelength accuracy:		**Single**	**Double**
	2400g/mm	-	± 0.1nm
	1200g/mm	± 0.2nm	± 0.2nm
	400g/mm	± 0.6nm	± 0.6nm
Detection Electronics			
Current amplifier:-		Six decade trans-impedance amplifier	
Gain ranges		10^{10}– 10^{5} V/A	
Analogue digital Converter:		100ms integration, 14 bit.	
Input Optics			
Light transport, FOP-UV		Flexible quartz fibre bundle	
Cosine response Diffuser, D7		f_2' error <1% 200-1100nm	
Direct view telescope, TEL309		Motorised telescope with CCD camera viewer	
Fields of View		1.7 & 11 mrads	
Measurement range		200mm-50m	
Interface and supply		USB, 24V switch mode	
Calibration Standards			
Measured Quantity		Spectral Irradiance 200-2500nm	
Measured Quantity		Spectral Radiance 300-1400nm	
Traceability		NPL, UK	

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