

# Stray Light Errors

The stray light rejection of a spectroradiometer is especially critical when measuring the ultraviolet spectroradiometric output of sources such as sunlight and tungsten lamp standards. The analysis below shows the errors associated with the measuring of these sources with a high quality single grating monochromator and with the UV-optimized, double grating monochromator-based OL 752 Spectroradiometer.

1. Irradiance @ 310 nm for a  $\Delta\lambda = 1$  nm

$$\begin{array}{ll} \text{Sunlight:} & E_S = 4.95 \times 10^{-6} \text{ W/cm}^2 \\ \text{Tungsten:} & E_T = 3.48 \times 10^{-7} \text{ W/cm}^2 \end{array}$$

2. Integrated Irradiance from 295 to 800 nm

$$\begin{array}{ll} \text{Sunlight:} & E_{\Delta S} = 2.9 \times 10^{-2} \text{ W/cm}^2 \\ \text{Tungsten:} & E_{\Delta T} = 7.0 \times 10^{-3} \text{ W/cm}^2 \end{array}$$

3. Stray Light Rejection of a High Quality Single Monochromator =  $10^{-4}$
4. Stray Light Rejection of the OL 752 Spectroradiometer =  $10^{-8}$

$$\text{Stray Light Error (\%)} = \frac{(E_{\Delta I} - E_I) R_I}{E_I} \times 100$$

Where:  $E_1$  = Irradiance of Source at Specified Wavelength  
 $E_{\Delta 1}$  = Integrated Irradiance of Source  
 $R_1$  = Stray Light Rejection

## Error Due to Stray Light for:

<u>Source</u>	<u>Single Monochromator</u>	<u>OL 752 Spectroradiometer</u>
Sunlight	58%	0.006%
Tungsten	201%	0.02%

In summary, the measurements made at 310 nm with the single monochromator have errors of 58% and 201% for sunlight and tungsten sources respectively because of the stray light, whereas measurements made with the OL 752 are virtually unaffected.

## WAVELENGTH ACCURACY AND REPEATABILITY

The wavelength accuracy and repeatability of a monochromator is also quite critical when measuring the spectroradiometric output of light sources such as sunlight, solar simulators, tungsten lamps, etc. in the ultraviolet spectral region.

The table below gives the effective error in a spectroradiometric measurement of sunlight and a typical tungsten lamp standard when there is an error of  $\pm 1$  nm in the wavelength setting of the monochromator.

<u>Wavelength</u>	<b>Effective Error</b>	
	<u>Sunlight</u>	<u>Tungsten Lamp Standard</u>
295 nm	$\pm 253\%$	$\pm 3\%$
300 nm	$\pm 119\%$	$\pm 2.6\%$
325 nm	$\pm 17\%$	$\pm 2\%$
350 nm	$\pm 7\%$	$\pm 1.9\%$
400 nm	$\pm 5\%$	$\pm 1.5\%$
600 nm	$\pm 0.1\%$	$\pm 0.46\%$
800 nm	$\pm 0.4\%$	$\pm 0.2\%$

