

Calibration of an Extreme Ultraviolet Transmission Grating Spectrometer

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The responsivity of an extreme ultraviolet transmission grating spectrometer with silicon photodiode detectors was measured using synchrotron radiation. The spectrometer was designed to record the absolute radiation flux in a wavelength bandpass centered at 30 nm. The transmission grating had a period of 200 nm and relatively high efficiencies in the +1 and -1 diffraction orders that were dispersed on either side of the zero-order beam. Three photodiodes were positioned to measure the signals in the zero order and in the +1 and -1 orders. The photodiodes had aluminum over-coatings that passed the desired wavelength bandpass centered at 30 nm and attenuated higher-order radiation and wavelengths longer than approximately 80 nm. The spectrometer's responsivity, the ratio of the photodiode current and the incident radiation power, was determined as a function of the incident wavelength and the angle of the spectrometer with respect to the incident radiation beam. The spectrometer's responsivity was consistent with the product of the photodiode responsivity and the grating efficiency, both of which were separately measured while removed from the spectrometer.

