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Calibration of Spaceflight EUV Spectrometers

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Beamline: X24C

Introduction: Two types of solar EUV spectrometers are calibrated. One utilizes a normal-incidence diffraction grating with a dual-bandpass multilayer coating operating in the 17 nm to 29 nm wavelength range. The other uses several transmission gratings to cover the 5 nm to 120 nm wavelength range. The first spectrometer will fly on the Solar-B mission to record high-resolution solar EUV spectra, and the second will fly on a GOES satellite to record the absolute solar EUV emission.

Methods and Materials: The work includes the calibration of the 6" collection mirror and the 4" toroidal grating, both with multilayer coatings, aluminum filters, CCD detectors, transmission gratings, and silicon photodiodes with thin metal coatings. The calibrations are carried out in a large space-qualified chamber using the dispersed EUV radiation from the X24C monochromator.

Results: The normal-incidence reflectance profiles in the 17 nm to 29 nm wavelength range have peak reflectance values of 25% to 35% and sufficient wavelength width to observe the solar emission lines of interest. The reflectance is uniform over the large areas (up to 6") of the optics.

Conclusions: The performance of the multilayer optics and the other instrument components are suitable for the solar satellite missions.