

On the Development of the Marshall Grazing Incidence X-ray Spectrograph (MaGIXS) Mirrors

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Abstract

The Marshall Grazing Incidence X-ray Spectrograph (MaGIXS) is a sounding rocket experiment that will obtain spatially resolved soft X-ray spectra of the solar corona from 0.5 – 2 keV. The optical system comprises a Wolter-I telescope mirror, a slit spectrograph, and a CCD camera. The spectrograph has a finite conjugate paraboloid pair, which re-images the slit, and a varied line-space planar reflection grating. Both the Wolter-I mirror and paraboloid pair are being fabricated at the NASA Marshall Space Flight Center (MSFC), using nickel replication. The MaGIXS mirror mandrels have been diamond turned, polished, and have yielded a set of engineering mirrors. Unlike other grazing incidence instruments, such as FOXSI, ART-XC, and IXPE, the MaGIXS prescriptions have large departure from a cone. This property exacerbates challenges with conventional lap polishing techniques and interferometric metrology. Here we discuss the progression of the optical surfaces of the mandrels through lap polishing, X-ray data from the replicated shells obtained in the MSFC Stray Light Facility (SLF), and our transition to using the ZEEKO computer numerical controlled (CNC) polisher for figure correction.