The Rainwater Memorial Calibration Facility for X-Ray Optics

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The Nuclear Spectroscopic Telescope ARray (NuSTAR) is a NASA Small Explorer mission that will carry the first focusing hard X-ray (5–80 keV) telescope to orbit. The ground calibration of the optics posed a challenge as the need to suppress finite source distance effects over the full optic and the energy range of interest were unique requirements not met by any existing facility. In this paper we present the requirements for the NuSTAR optics ground calibration, and how the Rainwater Memorial Calibration Facility, RaMcaF, is designed to meet the calibration requirements. The nearly 175 m long beamline sports a 48 cm diameter 5–100 keV X-ray beam and is capable of carrying out detailed studies of large diameter optic elements, such as the NuSTAR optics, as well as flat multilayer-coated Silicon wafers.