Adjustable X-Ray Optics with Sub-Arcsecond Imaging
PI: Paul Reid/SAO

Objectives and Key Challenges:
• Develop adjustable light weight x-ray optics with sub arcsecond performance
• Create the enabling optics technology for a large aperture high resolution x-ray mission (SMART-X) for selection at the next Decadal Survey

Significance of Work:
• Sub-arcsecond optics fabricated with traditional methods are too heavy; light, thin replicated optics performance is limited to ~7"
• By coating thin glass optics with piezoelectric material, whose shape can be altered by applying a voltage, we can correct unwanted figure distortions improving performance to <1"

Approach:
• Deposit piezoelectric material (PZT) on conical thermally formed glass
• Mount and align a piezo coated mirror pair
• Correct unwanted figure distortions by adjusting the voltage applied to the piezo material
• Prove out performance using x-ray testing

Key Collaborators:
• Susan Trolier Mckinstry (PSU)
• Brian Ramsey and Stephen O’Dell (MSFC)

Current Funded Period of Performance:
• Feb 2013 – Jan 2016

Recent Accomplishments:
• Demonstrated predicable, repeatable deformations on cylindrical optics that matched values predicted by models
• Completed mounting and aligning of mirror pair using first generation mount; starting mount design improvement phase
• Deposited strain gauges on piezo cells
• Calculated PZT life of > 1000 years from accelerated lifetime test results

Next Milestones:
• Mount / align improved conical optics in TRL-4 mount

Application:
• Large aperture and high resolution x-ray mission for the 2020s (Square Meter Arcsecond Resolution X-ray Telescope, SMART-X)

TRLin = 2    TRLcurrent est. by PI = 3    TRLtarget = 4