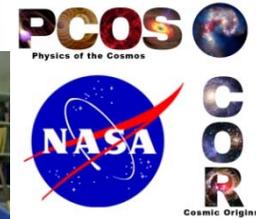


Development of 0.5-Arcsecond Adjustable Grazing-Incidence X-ray Mirrors for the SMART-X Mission Concept

PI: Paul Reid/Smithsonian Astrophysical Observatory



Objectives and Key Challenges:

- Develop an alignment and mounting scheme consistent with a large-area ($> 2\text{m}^2$), high-resolution ($< 0.5''$) X-ray telescope that accommodates many (~ 100) close-packed mirror segments - align to $0.25''$ (= Chandra alignment) with mounting distortions $< 1\ \mu\text{m}$ P/V (correctable with adjusters)
- Approach must allow calibration of mirror surface figure as each segment is mounted so that figure can be corrected before aligning the next segment
- Incorporate developments in high-connection-density flexible cabling and row-column addressing to minimize and simplify electrical connections for mirror adjuster command and control

Significance of Work:

- Enables adjustable optics to correct mounting-induced distortion and on-orbit thermal changes with LCD-display electrical simplicity

Approach:

- Investigate anisotropic conductive films for high connection density (up to 100 contacts/mm)
- Develop ZnO thin-film transistor over-layer with insulating top layer for row-column addressing and ease of electrical contact routing
- Through structural and thermal analysis and design, incorporate and extend alignment and mounting approach being developed for APRA TRL-4 X-ray test.

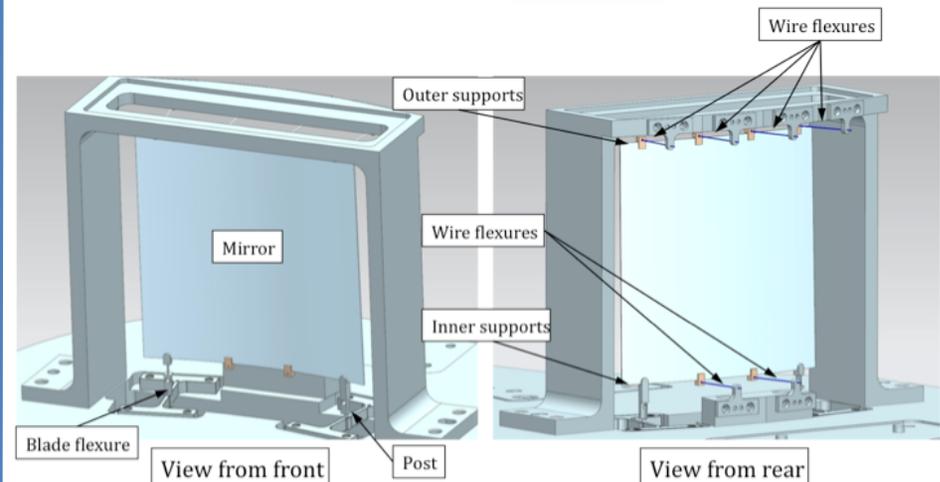
Key Collaborators:

- Susan Trolrier-McKinstry and Margeaux Wallace (PSU)
- Brian Ramsey and Steve O'Dell (MSFC)

Current Funded Period of Performance:

Proposed Jan 2015 – Dec 2016

Funding available Apr 2015 so plan Apr 2015 – Mar 2017



Single-shell mounting concept that will be modified for multiple shells

Recent Accomplishment:

- ✓ Completed initial thermal sensitivity analysis of thin piezoelectric film adjustable mirror in mounting concept

Next Milestones:

- Ray-tracing analysis of thermal modeling – 9/15
- Generation of thermal requirements for mirror ass'y – 10/15
- Structural Analysis and design for multi-shell ass'y – 2/16

Application:

- X-ray Surveyor (formerly SMART-X) mission concept

$TRL_{In} = 3$ $TRL_{Current} = 3$ $TRL_{Target} = 4+$