Contribution ID: **49** Contribution code: **THP45** Type: **Poster Presentation**

Parallel flexure-based RADSI instrument for curved X-ray mirror metrology

Thursday 18 September 2025 16:40 (1 hour)

New high-resolution X-ray beamlines demand reflective optics with higher surface profile accuracy to achieve diffraction-limited focusing. This necessitates advanced metrology instruments capable of delivering repeatable measurements in the nanometer to sub-nanometer range. Slope ranges exceeding 15 mrad (0.86°) and greater pose significant challenges for mirror metrology using conventional interferometric methods especially on shorter mirrors with low radius of curvature (<20 m). To address this, we present a new Relative Angle Determinable Stitching Interferometry (RADSI) instrument featuring a parallel flexure-based mechanical design. This approach enhances vibration and thermal stability while maintaining a compact and lightweight system. Initial measurements of a cylindrical mirror with a 16 m radius of curvature and a slope range of 5 mrad demonstrate nanometer-level repeatability. Comprehensive system characterization suggests the potential for achieving sub-nanometer repeatability with further refinement to the instrument.

Footnotes

Funding Agency

U.S. Department of Energy (DOE) Office of Science User Facility operated for the DOE Office of Science by Brookhaven National Laboratory under Contract No. DE-SC0012704

Author: LIENHARD, Lukas (Brookhaven National Laboratory)

Co-authors: Dr AUSTIN, Corey (Brookhaven National Laboratory); COBURN, David (Brookhaven National Laboratory); NAZARETSKI, Evgeny (Brookhaven National Laboratory); Dr HUANG, Lei (Brookhaven National Laboratory); Dr IDIR, Mourad (Brookhaven National Laboratory); Dr HULBERT, Steven (Brookhaven National Laboratory); Dr WANG, Tianyi (Brookhaven National Laboratory); XU, Weihe (Brookhaven National Laboratory)

Presenter: LIENHARD, Lukas (Brookhaven National Laboratory)

Session Classification: Thursday Poster Session

Track Classification: PRECISION MECHANICS: Nano-positioning