At-wavelength and optical metrology of bendable x-ray optics for nanofocusing at the ALS*

Sheng Yuan*, Kenneth Goldberg, Valeriy V. Yashchuk , Richard Celestre, Tony Warwick, Wayne R. McKinney, Gregory Morrison, Senajith B. Rekawa, Iacopo Mochi, Howard A. Padmore

**Lawrence Berkeley National Laboratory, Berkeley, CA 94720*

**syuan@lbl.gov*

Abstract: We report on a new research and development program at the Advanced Light Source, Lawrence Berkeley National Lab directed to establish both at-wavelength and conventional optical metrology techniques suitable to characterize the surface profile of super-high-quality x-ray optics with sub-microradian precision.

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1. Introduction to the project and the proposed experiments

Figure 1 illustrates the various techniques that we plan to develop and test in the course of the project. The techniques have been successful in the EUV energy range [1] and the goal of our investigation is to extend the methods to the soft x-ray energy range. Combination of these techniques with high precision optical metrology and experimental methods [2] will enable us to provide *in situ* setting and alignment of bendable x-ray optics to realize sub-100-nrad surface quality of super polished substrates and sub-100-nm focusing at beamlines. These new techniques will allow closed loop feedback systems to be implemented for x-ray nano-focusing. This performance level is beyond the reach of existing x-ray tools, but is already within the grasp of the leading mirror substrate manufacturers if they are provided adequate metrology [3].

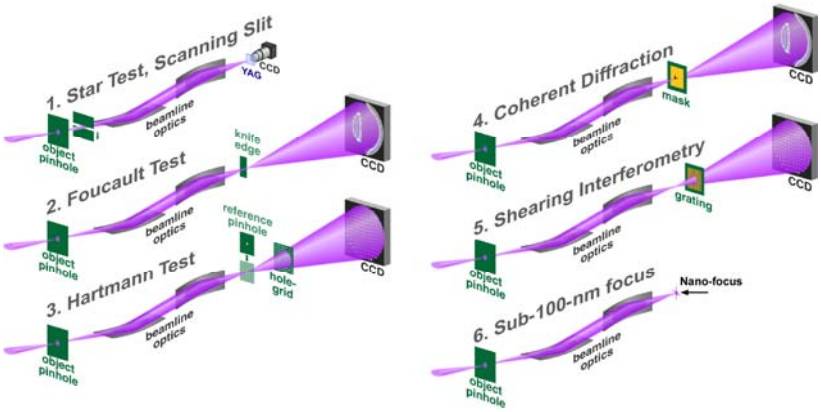

Fig. 1: Optical testing techniques under development.

References

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