# Two-foci, bendable mirrors for the ALS MAESTRO beamline: design and metrology characterization and optimal tuning of the mirror benders

Nikolay A. Artemiev, Ken P. Chow, Daniel J. Merthe, Eli Rotenberg,
Jeffrey H. Takakuwa, Tony Warwick, and Valeriy V. Yashchuk

*Lawrence Berkeley National Laboratory, Berkeley, California 94720*

MAESTRO, the Microscopic and Electronic STRucture Observatory, currently in the construction phase at the ALS, will be a world premier facility for the study of electronic and structural properties of in situ grown crystals. The new facility will be comprised of several end-stations, including angle-resolved photoemission spectroscopy (ARPES), sample sizes > 10 μm (μARPES end-station), sample sizes > 50 nm (nARPES end-station), and a photoemission electron microscope combined with a low-energy electron microscope (PEEM/LEEM). Redirection of the x-ray beam between the μARPES and PEEM/LEEM end-stations, which are longitudinally separated by 2.5 meters, uses a system of two bendable mirrors, placed in Kirkpatrick-Baez configuration. Here we present the details of the mirrors' design and report on the characterization of the mirrors carried out at the ALS optical metrology laboratory (OML). Optimal tuning and calibration of the mirrors was performed using a technique based on regression analysis of surface slope data obtained with a slope measuring long trace profiler (LTP) recently developed at the OML [Opt. Eng. 48(8), 083601 (2009)]. We provide results of tests of temporal and temperature stabilities of the shape of the mirrors. High reliability of the optical metrology with the mirrors has become possible due to a modification of the tuning procedure described in the present article. The modification allows accounting for the gravity sag effect, as well as the LTP systematic error in measurements with significantly curved x-ray optics. This work is supported by the U.S. Department of Energy under Contract No. DE-AC02-05CH11231.

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*Corresponding author: NArtemiev@lbl.gov

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