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Advantages of using a mirror as the first optical component for APS undulator beamlines

W. Yun, A. Khounsary, B. Lai, K. Randall, E. Gluskin, I. McNulty, and D. Shu
Advanced Photon Source, Argonne National Laboratory, 9700 S. Cass Avenue, Argonne, IL 60439

X-ray mirrors have been widely used in synchrotron x-ray beamlines for a broad range of applications, such as beam separation, focusing, or power filtering. In the SRI-CAT Sector 2 insertion-device beamlines, an x-ray mirror with three stripes of coating materials is used to achieve the following four objectives: (1) a substantial reduction in the peak radiation heat flux and total power on the downstream monochromator so that a water-cooled, conventional symmetric double-crystal monochromator (DCM) can be used; (2) a significant reduction in the radiation shielding requirement such that undulator radiation in the 0-35 keV spectral range can be delivered to the experimental stations with shielding requirements similar to those for a monochromatic beam; (3) suppression of unwanted higher-order undulator harmonics with a mirror/monochromator combination; and (4) separation of the undulator radiation from the bremsstrahlung such that a small offset between the incident and diffracted beam of the DCM can be used and this will allow the DCM to be used as a quasi-channel-cut monochromator with negligible displacement of the diffracted beam. In this paper, the advantages of using a mirror as the first optic for an undulator beamline is presented.

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