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Optical design of a 1-4 keV beamline for microscopy and coherence experiments at the Advanced Photon Source

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Commissioning of the third-generation Advanced Photon Source will open up dramatic new opportunities for experiments requiring high brightness sources of x-rays. In particular, x-ray microscopy and coherence experiments in the 1-4 keV intermediate energy region have been relatively unexplored. We are currently building the 2-ID-B beamline at the Advanced Photon Source for this purpose. A dedicated 5.5-cm-period undulator will provide a high brightness beam of x-rays tunable from 0.5 to 4 keV. The beamline uses horizontally deflecting, grazing-incidence optics to preserve the coherence of the undulator beam in the vertical direction. Three water-cooled mirrors in tandem handle the large total power and high power density in the incident beam and provide the focusing necessary for high throughput and stigmatic performance. Monochromatization of the beam is provided by a water-cooled entrance slit, a set of interchangeable cooled gratings, and a translatable exit slit. A differential pump and silicon nitride exit window isolate the precision optics from contamination and permit the x-ray beam to be used in air. In this paper, we present the beamline optical design and expected performance.

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