

Design of a Vacuum-Compatible, High-Precision, Monochromatic Beam-Position Monitor for Use with Synchrotron Radiation from 5-25 keV

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The Structural Biology Center beamline 19-ID has been designed to take full advantage of the highly intense undulator radiation and very low source emittance available at the Advanced Photon Source. In order to keep the x-ray beam focused onto the presample slits, a novel position-sensitive PIN diode array has been developed. The array consists of four PIN diodes positioned upstream of a 0.5-mm-thick metal foil placed in the x-ray beam. Using conventional difference over the sum techniques, 2-dimensional position information is obtained from the

metal foil fluorescence. Because the full x-ray beam passes through the metal foil, the true beam center-of-mass is measured. The device is compact, inexpensive to construct, operates in vacuum, and has a working range of 8 mm × 10 mm that can be expanded with design modifications. Measured position sensitivity is 1-2 mm. Although optimized for use in the 5-25 keV energy range, the upper limit can be extended by changing metals or adjusting foil thickness.