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Design of the Structural Biology Center beamlines at the APS

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The Structural Biology Center (SBC)-CAT will develop and operate a sector of the APS as a user facility for studies in macromolecular crystallography. The techniques applied will include multiple-energy anomalous dispersion (MAD) phasing and polychromatic (Laue) data collection. Data will be recorded on a high resolution CCD-area detector.

The SBC is constructing two beamlines, one for radiation from an undulator and one for radiation from a bending magnet. The X-ray optics of both beamlines is designed to produce a highly demagnified image of the source in order to match the focal size with the sizes of the sample and the resolution element of the detector. Vertical focusing is achieved by a flat, cylindrically bent mirror. Horizontal focusing is achieved by sagittally bending the second crystal of a double crystal monochromator.

The double crystal monochromators of both beamlines have a constant exit height output beam. On the undulator beamline, two double crystal monochromators are installed in series - one with Si-111 crystals and the second with Si-220 crystals - in order to facilitate quick change between high flux and narrow bandwidth. For the heat-loaded first crystals, the liquid-nitrogen-cooled, thin web design being developed by the APS has been adopted. On the bending magnet beamline, three crystals (Si-111, Si-220, Si-400) are mounted side-by-side on the first crystal stage and translated into the beam as required.