

Focusing bent crystal monochromators for high energy synchrotron radiation

Ulrich Lienert

Optics Group, European Synchrotron Radiation Facility, BP 220, 38043 Grenoble Cedex, France

Clemens Schulze

Paul Scherrer Institute, Villigen und Würenlingen, Villigen 45232, Switzerland

Experimental results and a theoretical description of bent crystal monochromators on ESRF beamlines at high x-ray energies (30 - 100 keV) are presented for two examples.

First, it is shown that a focus broadening due to the penetration of the x-rays into the crystal can be avoided in the asymmetric Laue geometry. A monochromator was designed for high pressure diffraction experiments and a source size limited focus below 10 micrometers was achieved. Diffraction patterns from a standard powder sample were recorded on image plates.

Second, a focusing, energy tunable, fixed-exit monochromator was constructed combining asymmetric bent Laue and Bragg crystals. It is shown experimentally that the source emittance is conserved by bent crystals. However, a focus broadening results from the boundary conditions of asymmetric reflection geometries. First experiments show that the combination of bent crystals is well suited for high energies and superior to classical monochromator schemes employing flat crystals (sagittal focusing, mirror - crystal combination).