I-01

Coherent x-ray scattering using undulator radiation at the ESRF

Douglas L. Abernathy and Gerhard Grübel
Experiments Division, European Synchrotron Radiation Facility, B.P. 220, 68045 Grenoble, France

G. Brian Stephenson
Materials Science Division, Argonne National Laboratory, 9700 S. Cass Avenue, Argonne, IL 60439, U.S.A.

Stephan F. Brauer and Ian L. McNulty
Experimental Facilities Division, Argonne National Laboratory, 9700 S. Cass Avenue, Argonne, IL 60439, U.S.A.

Simon G. J. Mochrie
Physics Dept., Massachusetts Institute of Technology, 77 Massachusetts Ave., Rm. 13-2010, Cambridge, MA 02139, U.S.A.

Alec R. Sandy
APS/IMM-CAT, Massachusetts Institute of Technology, c/o Argonne National Laboratory, 9700 S. Cass Avenue, Argonne, IL 60439, U.S.A.

D. Mark Sutton
Centre for the Physics of Materials, McGill University, Rutherford Building, 3600 University Street, Montréal, PQ H3A 2T8, Canada

T. Thurn-Albrecht
MPI, Ackermanweg 10, 55198 Mainz, Germany

We report on a simple approach to producing a high coherent flux x-ray beam for small angle scattering studies at the Troika beamline (ID10) of the European Synchrotron Radiation Facility. In this case the longitudinal coherence length of the beam, which is inversely related to the energy bandpass, can be reduced due to the small optical path length difference of the scattering. By using mirrors and filters to cut unwanted energies from the undulator harmonic structure, we are able to produce a high flux (~$5x10^9$ photons per second through a 5-micron-diameter pinhole at 8 keV) beam with a bandpass of a few percent. The qualities of this beam have been measured by analyzing static speckle patterns from an aerogel sample imaged by a directly illuminated CCD camera. The intensity, speckle size, and visibility or contrast is compared for different beamline configurations. Similar information is also found from dynamic studies of colloidal systems, using both the CCD system as well as hardware correlation of the signal from a scintillator.