III-07

# High-resolution measurements in grazing-incidence x-ray diffraction

Elena A. Kondrashkina, Sergey A. Stepanov, M. Schmidbauer, and R. Opitz
*MPG-AG "Roentgenbeugung", Hausvogteiplatz 5-7, Berlin 10117, Germany*

Rolf Koehler
*Institut fuer Physik - AG Roentgenbeugung, Humboldt-Universitaet zu Berline, Hausvogteiplatz 5-7, D010117 Berlin, Germany*

H. Rhan
*HASYLAB, DESY, Notkestr. 85, Hamburg 22603, Germany*

The peculiarities of the angular discrimination of coherent and diffuse scattering in grazing incidence x-ray diffraction (GID) have been analyzed, both theoretically and experimentally.

In conventional nongrazing x-ray diffraction, coherent and diffuse scattering are discriminated in the plane of diffraction with the help of an analyzer crystal. This angular analysis carried out at different sample deviations from the Bragg angle provides a 2D mapping of reciprocal space. In GID, the angular discrimination of coherent and diffuse scattering in the plane of diffraction and in the plane normal to the surface is equally important. This requires a combination of an analyzer crystal and a position-sensitive detector and corresponds to a 3D mapping of reciprocal space.

The formulae for the simulation of the coherent part of high resolution spectra in GID have been derived and the angular positions of collimator, sample, and analyzer peaks have been found. The experiments carried out with a Ge crystal and an AlAs/GaAs superlattice at DESY and ESRF have been in good agreement with the theory. The optimization of the resolution function for the measurements of diffuse scattering is discussed.