ESRF	**Experiment title:** Meausurement diffracted intensity from multiple asymmetric diffraction monochromator crystals near the critical angle	**Experiment number**: MI 754
Beamline:	**Date of experiment**: from: 11/5/2005 to: 15/5/2005	**Date of report**: 30/8/2005
Shifts:	**Local contact(s)**: Dr. Luca Peverini	*Received at ESRF:*

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Report

The purpose of the proposed experiment was to investigate theBragg diffraction reflectivity profiles in a region of grazing incidence to the crystal surface close to the critical angle of total reflection in silicon and germanium V-shaped monochromator crystals as shown in fig. 1. In particular the width of the diffraction profile as well as the deviation from the Bragg position as a function of the glancing angle ϕ_1 had been measured. According to the usual dynamical theory of X-ray diffraction for grazing incidence angles approaching zero the full width at half maximum (FWHM) of the Bragg peak as well as the deviation from the Bragg angle value in the vacuum diverge.

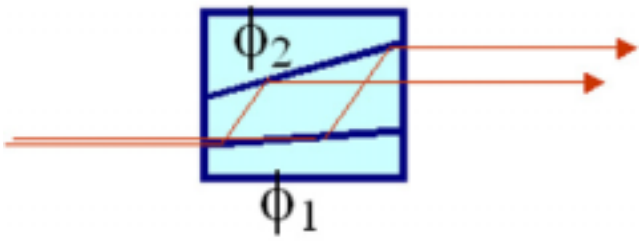


Fig. 1

Due to the very small glancing angle ϕ_1 at the first surface of the crystal the refectivity profile as well as the double diffracted beam could be registered at the same time by a open window detector, as visible in the experimental setup in fig. 2.

A V-shaped Si sample (Si1) with a glancing angle of 1 degree at the first surface for the 400 diffraction with CuKα wavelength and a V-shaped Ge sample (Ge06) with a glancing angle of 0.6 degrees at the first surface for the 220 diffraction with CuKα wavelength have been investigated.

The energy of the X-ray beam was selected by using a double crystal Si 111 monochromator and was increased from 8.04 KeV, corresponding to CuKα wavelegth, to 8.2 KeV, reducing the value of the grazing angle ϕ_1 at the Bragg condition.

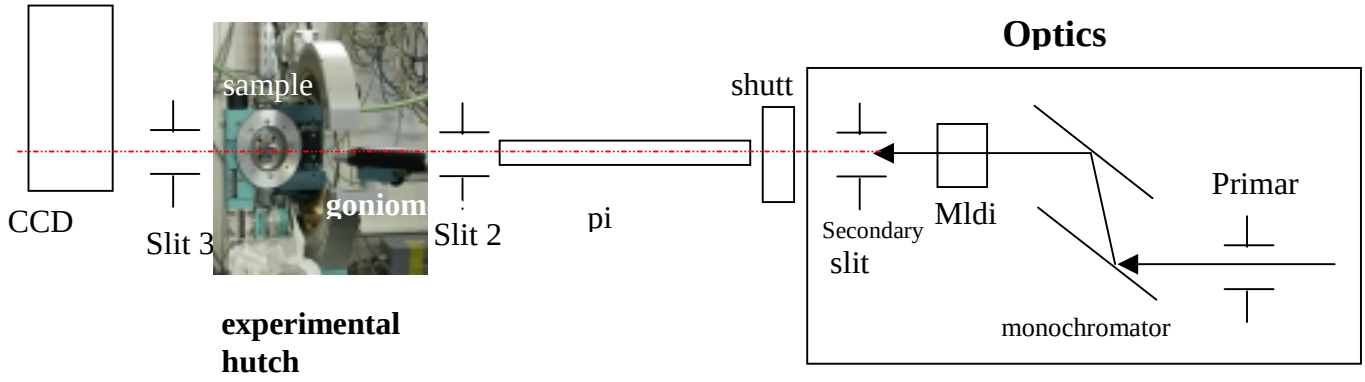
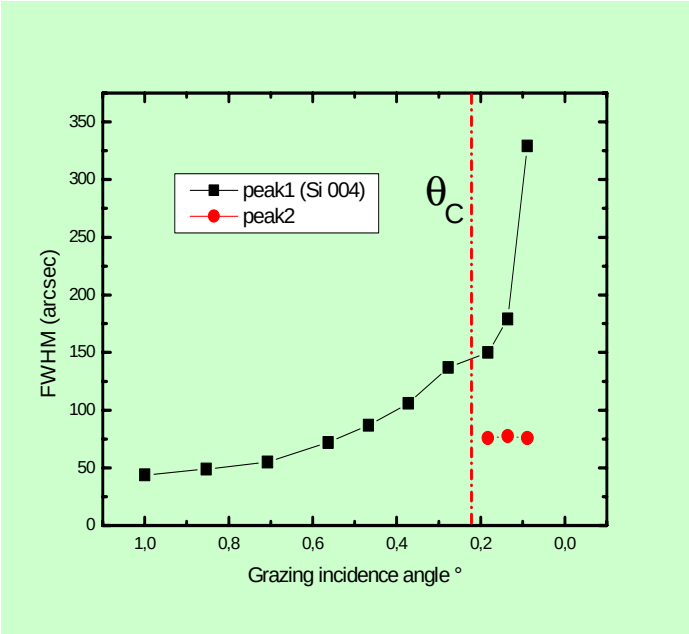
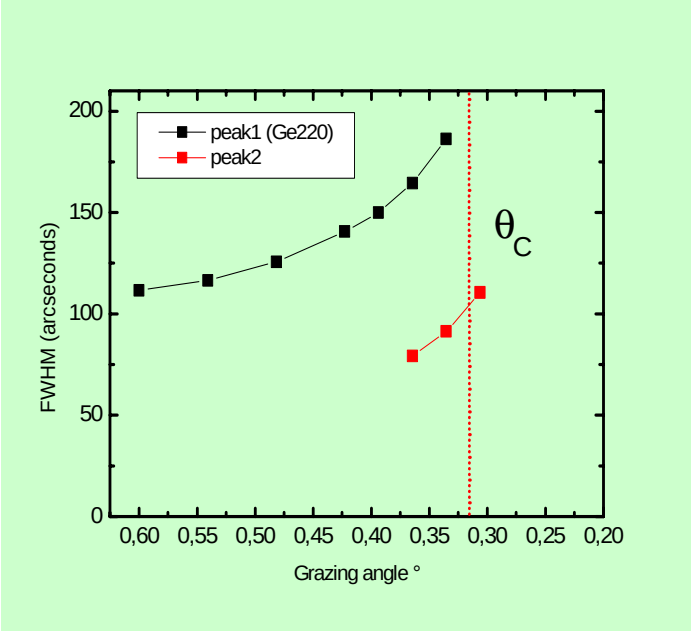


Fig. 2

For each wavelength the diffraction and the reflectivity profiles were registered at the same time. The plots of the FWHM of the diffraction profiles as a function of the grazing incidence angle at the Bragg condition is reported in fig. 3. The critical angle for which the the total reflectivity starts is also reported





For both Si and Ge samples we observed that the value of FWHM was increasing by decreasing the incidence angle. Furthermore the results show that for glancing angles very close and, in the case of Si1 sample, larger than the critical angle for total reflection no maximum of the dependence of FWHM of the diffraction peak is observed. This result disagrees with results previously reported (1).
The use of a CCD detector permitted to control the condition of total reflection and to visualize the diffracted and the reflected beams.

The analysis of the data and the images of the diffracted as well as the reflected beams is in progress.

(1) Kikuta, S. & Kohra, K. (1970). J. Phys. Soc. Jpn, 29, 1322±1328.

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