ESRF	**Experiment title:** **Nuclear Resonance Energy Analisys of Inelastic X-Ray Scattering**	**Experiment number:** **MI-150**
Beamline: **ID18/BL11**	**Date of experiment** from **31.07.1996** to: **03.08.1996**	**Date of report:** **6 September 1996**
shifts: 12	**Local contact(s):** **Chumakov Aleksandr**	***Received at ESRF:*** 0 9 SEP 1996

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Report:

Due to the canceling the scheduled 32-bunch mode we concentrated our efforts not on the energy analisys of inelastic X-ray scattering, but on the improvement of the energy resolution.

The high resolution monochromator, which we used for the nuclear resonance energy analysis of inelastic X-ray scattering up to now [1], had the 6.4 meV enrgy resolution [2]. In this experiment our target was to come close to 1 meV resolution.

In contrats to previous experiments, where the nested [3] set-up was imployed, we used the scheme with two independent crystals with Si (975) reflection (Fig. 1). This is the highest order

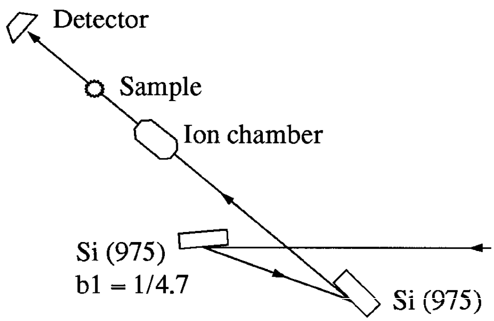

Figure 1: Experimental set-up.

reflection for the used 14.4 keV radiation (this energy is determined by the energy of ^{57}Fe nuclear transition).

We have measured the energy resolution using nuclear forward scattering [4] of the reflected beam in samples, which contain the resonant nuclei ^{57}Fe. This scattering results in a time-delayed signal, which occurs when the energy of the reflected beam coincides with the energy of the nuclear transition. The measured instrumental function of the monochromator is shown in Figure 2.

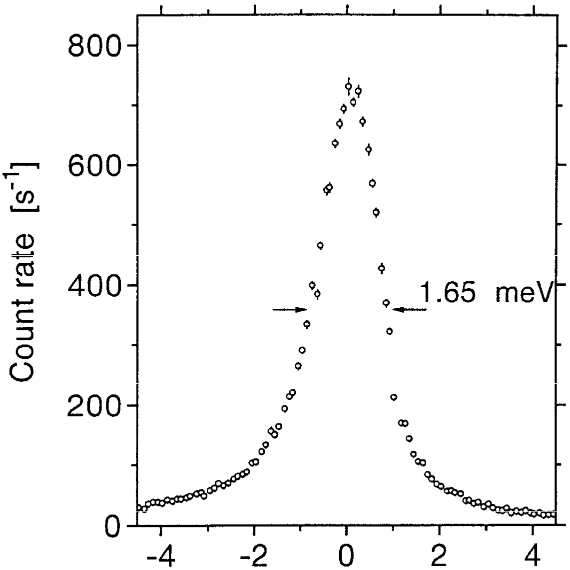

Figure 2. Instrumental function of the monochromator

The energy resolution, measured as a full width at half maximum is 1.65 meV, only a little broader than the ideal case (1.3 meV). The flux of the reflected radiation was measured as $1.2x10^8$ photons per second at 90 mA storage ring current. Within the theoretical 3.6 μrad monochromator acceptance this corresponds to 30% of the spectral density (photons/eV) of the primary beam; only slightly lower than that calculated for ideal crystals (50%). The extremely good performance of the monochromator allowed us to perform high-resolution measurements of nuclear inelastic absorption. The more details of the experimental results are reported in the forthcoming publication [5].

References:

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