ESRF	**Experiment title: Time resolved measurements of the incoherent electron channel of the 14.4keV resonance in ^{57}Fe**	**Experiment number:** HE 181
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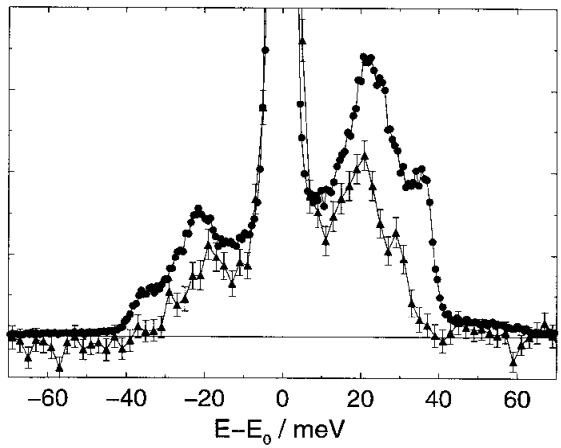
Report:

Despite of the fact that we got Hybrid-4 mode instead of the desired 16-bunch mode we succeeded to measure the conversion electron yield of α-^{57}Fe as a function of excitation energy. The detector used for these experiments shows a load dependent background which is not constant in time and makes it therefore difficult to evaluate the time spectra. Hybrid-4 mode gives less than a forth of the resonant count rate compared to 16-bunch mode while having more than twice the load of non-resonant prompt count rate.

During the last 2 years a new technique has been developed to measure the phonon density of states of materials containing ^{57}Fe[2, 4, 1] by nuclear inelastic resonant scattering of synchrotron radiation. This technique exploits the fact that after internal conversion 6.4 keV fluorescence radiation can appear besides Auger electrons. In this measurement we directly detected the conversion electrons.

As usual for nuclear inelastic scattering experiments we used after the high heat load monochromatisation a high resolution monochromator, in this case with 4.4 meV band width. After installation of this monochromator, search for the resonance, and optimisation of detector parameters we had still two days for data collection.



The figure shows the measurement of conversion electrons (triangles) in comparison to the "conventional" measurement with fluorescence radiation. Obviosly these two spectra look different. The electron spectrum ends at about 30meV while the spectrum taken with fluorescence radiation ranges up to 40 meV.

The interpretation of these data is not yet clear. The most important difference between conversion electrons and fluorescence radiation is the escape depth. Since the attenuation length of 6.4 keV x-radiation is 20 μm the detected radiation comes from the whole sample. In contrast K-conversion electrons have a mean escape depth of about 100 nm which has been determined in previous measurements [3]. Therefore a possible explanation is that the electrons show the phonon spectrum of a surface near layer while the x-ray spectrum shows the phonon spectrum of the bulk.

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