ESRF	3-D momentum density reconstruction of Y	**Experiment number:** HE-786
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Report:

Directional Compton profiles of yttrium have been measured using 12 single crystals, cut along special directions, determined in the basis of model calculations. All crystals had the same thickness in order to minimize the effects due to multiple scattering and background contribution. The incident photon energy was 56 keV and the momentum resolution about 0.16 a.u. Two shifts were used for each sample to collect about 150,000 counts at the Compton peak.

The aim of the experiment was to reconstruct the momentum density $N(\mathbf{p})$ using a technique based on the Radon transform, well known in tomography applications. Because Compton profile is a one-dimensional projection of $N(\mathbf{p})$, many directions have to be measured; the number depends on the crystal structure and the method used in the reconstruction. It has been shown [1] that one should avoid the high symmetry directions.

Earlier positron annihilation studies [2] have shown that yttrium has a "webbing" Fermi surface structure, typical also for some rare-earth metals, like Tb, Dy, Ho and Er. It is suggested that the helical antiferromagnetic ordering in these materials is driven by the Fermi surface.

Compared with positron annihilation, the Compton scattering technique is not so sensitive to the quality of the crystal and the measured cross section is closely related to the ground state electronic properties. On the other hand all electrons contribute whereas positrons annihilate mostly with the interesting outer electrons.

Figure 1 shows some of the measured anisotropies. The reconstruction is in progress.

[1] G. Kontrym-Sznajd and M. Samsel, Appl. Phys A 3, November 1999
[2] S. B. Dugdale, H. M. Fretwell, M .A. Alam, G. Kontrym-Sznajd, R. N. West and S. Badrzadeh, Phys. Rev. Lett. **79**, 941 (1997)

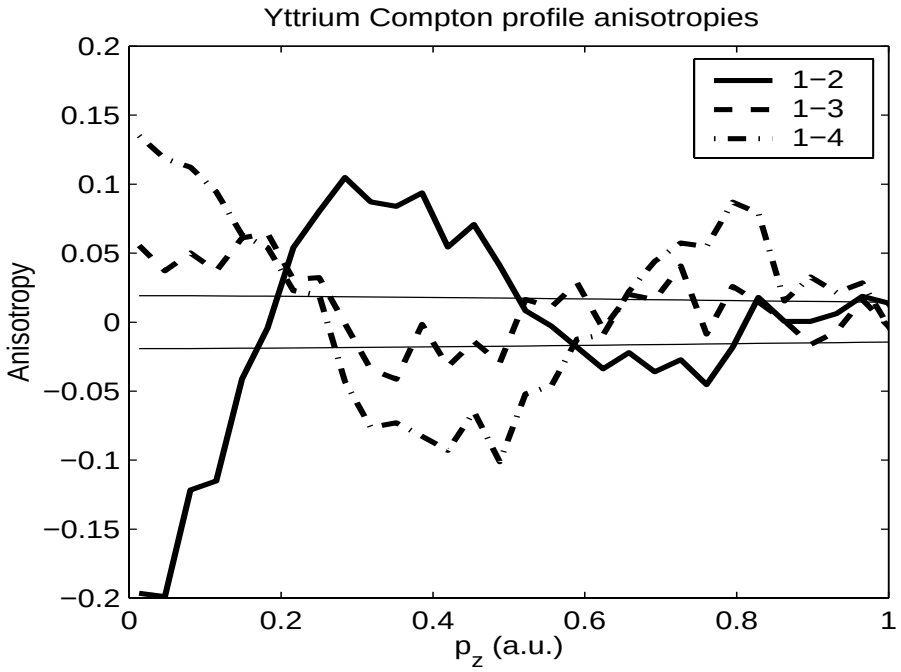

Figure 1. An example of three Compton profile anisotropies $J_i(p_z) - J_j(p_z)$ of measured yttrium samples. Labels refer to samples numbered 1, 2, 3, and 4 out of total 12. Two horizontal lines represent the size of the error bars due to statistical noise.