ESRF	Experiment title: **Polarisation of the 5d band of Dy caused by Cu contamination.**	**Experiment number**: 28-01-89
Beamline: BM28	**Date of experiment**: from: 27/10/00 to: 31/10/00	**Date of report**: 25/09/01
Shifts: 12	**Local contact(s)**: Dr A Stunault	*Received at ESRF:*

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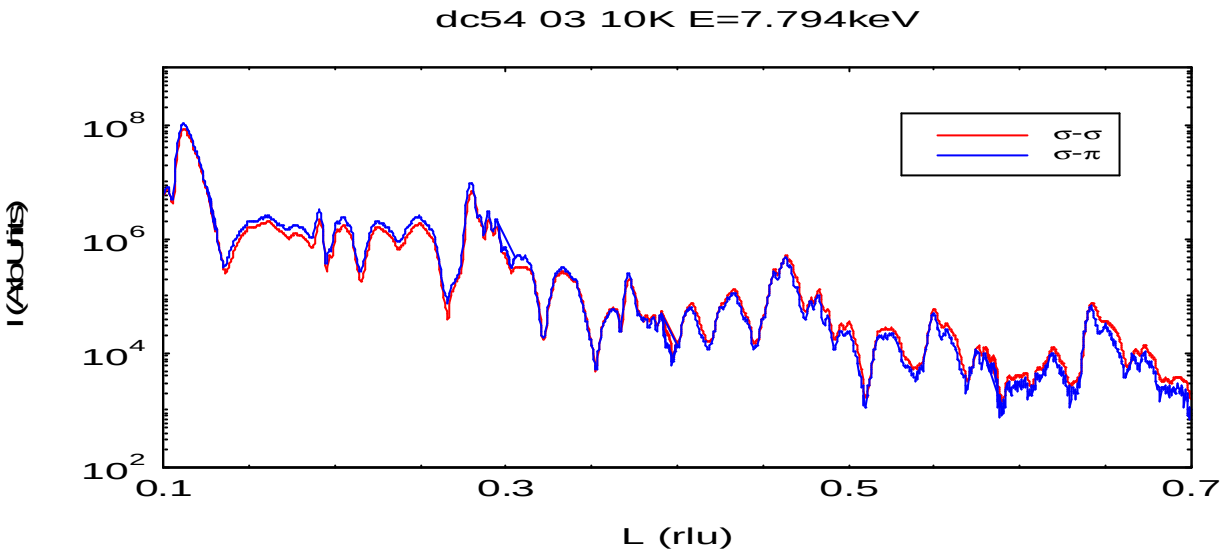
Report:

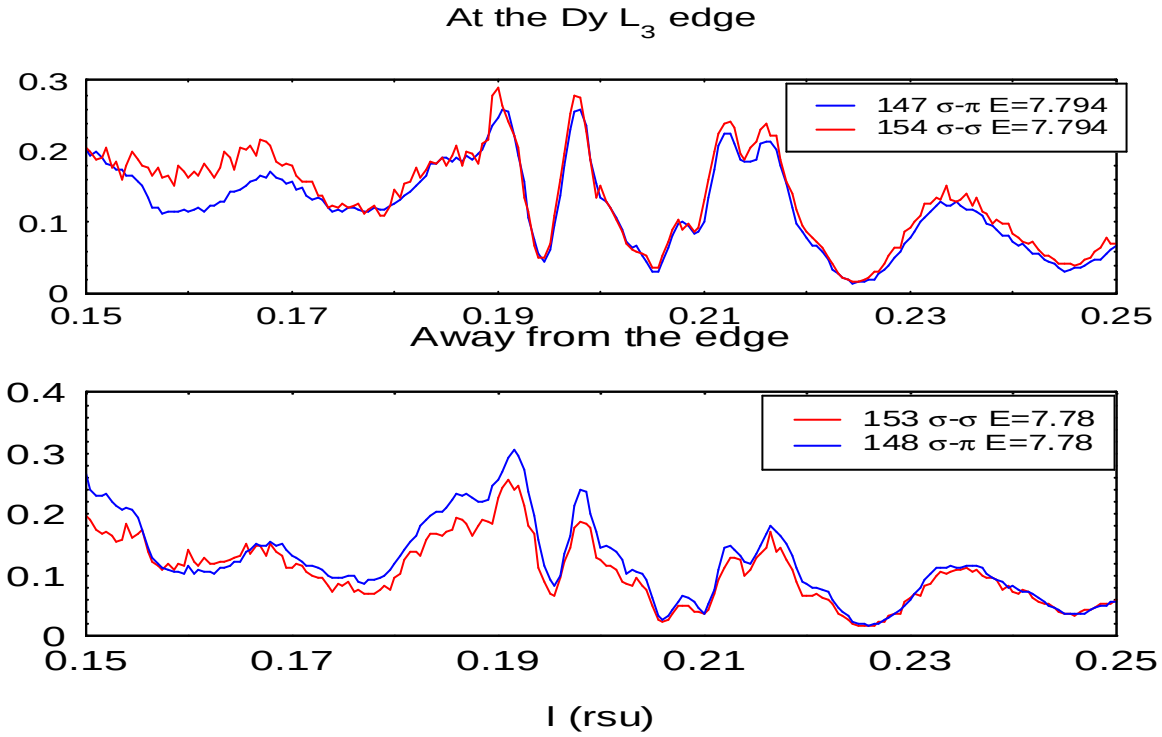
The aim of this experiment was to probe the 5d polarisation of Dy and measure changes in this as a function of Cu doping. The idea was that if the Fermi energy could be moved a small amount by the Cu doping, then from density of states calculations, a large change in the 5d spins polarisation might be expected. In a previous XMAS experiment we had observed some evidence for magnetic scatter in DyCu multilayers. In data for an energy scan at 10K we observed changes at the Dy L_3 edge the s-p channel at a superlattice peak which were absent in the s-s data. However when we did the magnetic field dependence, the only signs of magnetic scatter were in scans taken near room temperature when the Dy was paramagnetic. These results are still not understood.

For this run we grew samples composed of [Co/Ru/Co/Dy] x n. Co/Ru samples display strong antiferromagnet coupling and Dy will order antiferromagnetically to Co, in this way we can create antiferromagnetic order between the Dy layers.

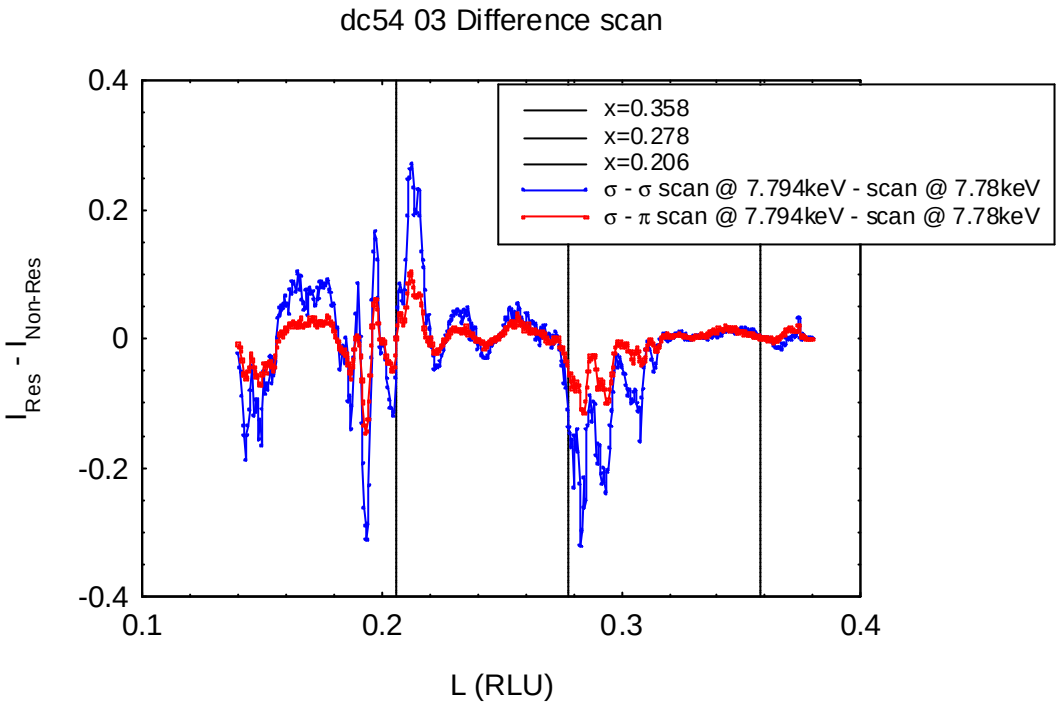
The run suffered from several technical difficulties. We couldn't start until late morning of the first day, the magnet didn't work until evening on the second day, the automated slits were not working properly but we discover what the problem was for at least 24 hours.



The data above is an (00l) scan with polarisation analysis taken at the Dy L_3 edge. It clearly shows little or no evidence of magnetic scatter. We looked closer at the region between 0.1 and 0.3 rlu to examine the possiblity that the small differences found there might have a magnetic origin.



This figure compares scans at and away from the Dy edge. We can see that the noise in the data (possibly due to leakage between the channels?) for the non-resonant case is as large as the differences in the resonant data so we conclude that this is not evidence for magnetic scatter.



The final figure shows the difference in the resonant and non-resonant scatter. The vertical bars represent positions of the multilayer Bragg peaks. Again, the differences are small but the largest differences appear in the s-s channel which indicates that the source of this scatter is not magnetic. Other samples showed similar behaviour. We did attempt to do scans as a function of magnetic field and temperature but the beam died during the final night and no magnetic field data was actually collected. We did not have time to investigate the role of Cu impurities in Dy.

Although the run had many technical faults we did manage to do scans which should have revealed magnetic scatter but we found no evidence for such scatter. This is still not understood.