ESRF	**Experiment title:** Spin-resolved magnetic circular dichroism in core level photoemission	**Experiment number:** HE36
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Report: During this run our new combined apparatus for spin-resolved photoemission, photoabsorption and reflection, and photoemission microscopy was operated for the first time on a synchrotron beamline. The photoemission microscope was installed in a new vacuum chamber with low residual magnetic fields. The chamber is mounted on vibration-damping supports. This significantly improved the resolution achieved in the photoemission microscope compared to our previous run at the ESRF. With a new electron-optical column which is available now a resolution in the range of 100 nm is possible. A sample load lock allows to introduce samples into the main chamber for photoemission experiments, or into the microscopy chamber. Also, samples can be stored in a magazine in UHV environment. In both chambers simultaneous total yield and reflectivity spectra can be taken for incidence angles from grazing to about 45°.

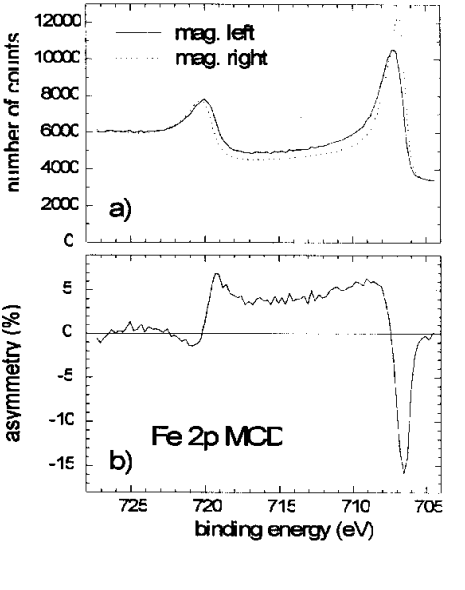
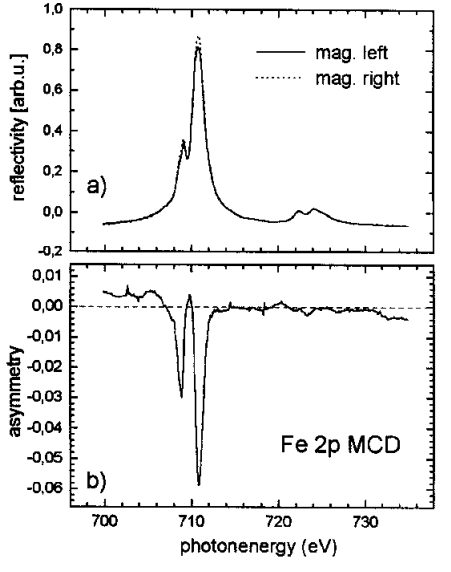


Fig. 1 shows the circular dichroism in the Fe 2p photoemission spectrum taken during this run with 810 eV photons. Apart from the dichroism at the 2p ½ and 3/2 photoemission peaks, there is a dichroism in the region between these two peaks, which probably originates form remnants of the atomic multiplet structure. Due to a failure of the computer interface running the experiment the spin-resolved experiments are not complete. The experiment did show, however, that the photon flux is sufficient for this type of experiment, and provided data for the comparison between circular and linear dichroism.

To demonstrate the versatility of the new apparatus, Fig. 2 shows reflectivity spectra of magnetite taken with circularly polarized x-rays around the Fe excitation threshold for an incidence angle of 15" measured to the surface. The sample was a thin epitaxial film magnetized uniformly prior to introduction into the vacuum system. The spectrum shows richly structured features at the Fe 2p 3/2 and 2p ½ excitation thresholds. Closer inspection shows that the 2p 3/2 structure consists of even more than two peaks, in qualitative agreement with absorption data. The reflectivity spectrum changes upon reversal of light helicity, i.e. there is a circular dichroism at the Fe 2p threshold. The spectra show a pronounced dependence on the angle of incidence, which allow to enhance or suppress certain features in the spectra, and thereby reveal more detail of the multiplet structure.



Under certain conditions the dichroic asymmetry is largely determined by either the real or imaginary part of the off-diagonal of the dielectric constant. This allows to use the sum rules to determine magnetic moments from reflectivity spectra.

Microscopy of ferromagnetic domains was performed on ultrathin Fe films grown in situ on Ag single crystal substrates. As mentioned above, the resolution was significantly better than in previously. Some of the images showed relatively large domains with boundaries running along low index direction of the crystal surface, while in other cases the domains were much smaller and had irregular shapes. The irregular domain shapes are generated by the spin reorientation transition which takes place from perpendicular to in-plane orientation as the Fe coverage exceeds 6 monolayers. The studies were extended to ultrathin Mn coverages grown on Fe. In these experiments antiferromagnetic coupling between Fe and the adsorbate was confirmed for coverages up to about one monolayer of Mn, above which limit the Mn magnetic signal disappears.