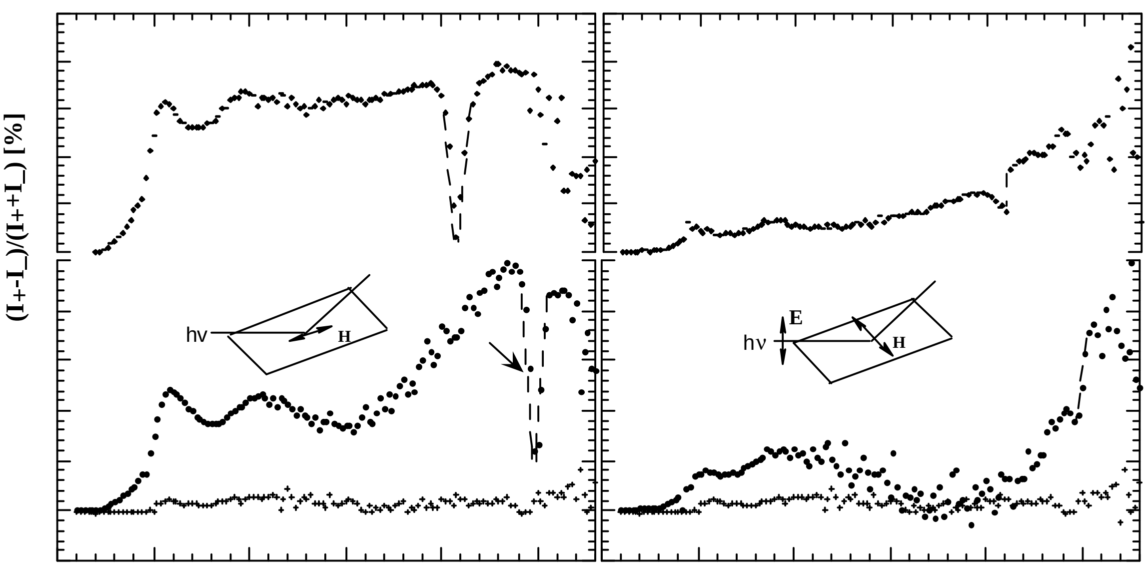
SOFT X-RAY RESONANT MAGNETIC SCATTERING OF Fe/C MULTILAYERS

O. Zaharko, H. Grimmer, *PSI, Villigen, Switzerland*
H.- Ch. Mertins, F. Schäfers, *BESSY, Berlin, Germany*

The interference between magnetic and resonant X-ray scattering from a magnetic sample illuminated by polarized X-rays, leads to a number of interesting magneto-optical effects [1], which have fundamental and technological potential.

We present data on the resonant X-ray magnetic scattering near the Fe $L_{2,3}$-edges of three Fe/C multilayers varying the thickness of the Fe- and C- layers deposited on Si by magnetron sputtering (100 periods, Λ=2.4 nm (1), 2.0 nm (2) and 2.1 nm (3)). We used elliptically polarized X-rays at the BESSY beamline PM4 (P_L=0.77, P_C=0.62) and the BESSY soft X-ray polarimeter [2]. Two magneto-optical effects: circularly polarized resonant X-ray magnetic scattering (CRXMS, longitudinal magnetic field **H** is applied) and transverse magneto-optic Kerr effect (T-MOKE, transverse magnetic field **H**) were studied.

The magnitude of the effects is described by an asymmetry ratio $(I_+-I\_)/(I_++I\_)$, where I_+ and $I\_$ are the reflectances at two opposite directions of **H**. The asymmetries are the largest at the L_3-edge and approach 25% for the multilayer 1. The figure shows the asymmetry as a function of the angle of incidence θ in the CRXMS (left) and T-MOKE (right) geometries for three Fe/C multilayers. At the Bragg peak (marked by arrows) the asymmetries are strongly reduced for the CRXMS geometry and not for the T-MOKE.



The largest asymmetries are observed for the largest thickness of the C- and Fe-layers (1). The asymmetries decrease when decreasing the thickness of the C-layers (2) and, especially, Fe-layers (3). This indicates different magnetic coupling of the Fe moments within/between the layers.

[1] S. W. Lovesey, S. P. Collins *X-ray scattering and absorption by magnetic materials* 1996 (Clarendon Press, Oxford).
[2] F. Schäfers et al. *Appl. Opt.* 38 (1999) 4074.