Ultrafast laser induced dynamics of localized 4f spins in Co_xGd_{100-x} layers by element- and time-resolved XMCD.

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Recent experimental and theoretical studies have revealed fundamental dissimilarities in the laser induced ultrafast dynamics of 3d spins in transition metals and 4f spins in rare-earth elements. Our current research aims at revealing the origin of such disparities between the rare-earths and transition metals [1, 2]. In this project, we focus on the origin of the two-step demagnetization in rare-earth thin layers. Therefore, we propose an experimental protocol, sustained by theoretical calculations, to challenge the microscopic 3 temperatures model whose predictions for rare-earth are currently intensively debated. This objective will be tackled by investigating the laser induced ultrafast dynamics of Co3d and Gd4f spins in Co_xGd_{100-x} alloys by means of time-and element-resolved X-ray Magnetic Circular Dichroism (tr-XMCD) with 130 femtosecond time resolution. The project requires experiments at large scale facilities, using ultra-short X-ray pulses of E~ 1000 eV.

Figure 1 : Synchrotron ring, producing intense and polarized X rays delivering light with energies from 10 eV to 30 keV.

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[1] Boeglin et al. Nature 465, 458 (2010)

[2] Bergeard et al. Nature Communications 5, 3466 (2014)