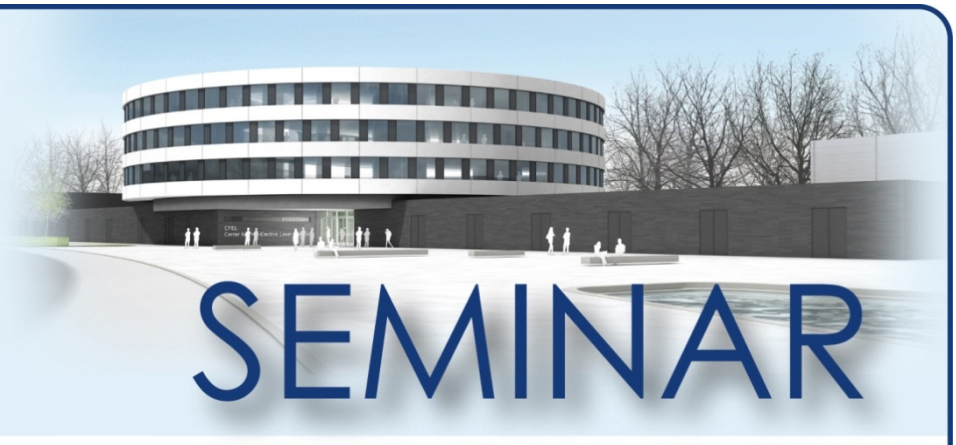
CFEL SCIENCE



SEMINAR

24th July, 2017 – 11:00 am

CFEL-bldg. 99, seminar room I (EG.076)

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IPCMS, CNRS & University of Strasbourg

Ultrafast magnetization dynamics in ferromagnetic transition metals: A study of spins thermalization induced by femtosecond optical pulses and of coupled oscillators excited by picosecond acoustic pulses

This talk includes (i) the dynamics of interlayer coupling between ferromagnetic transition metals across a metallic spacer layer and (ii) the initial instants of the laser induced demagnetization in Ni & Co using 10 fs optical pulses. The dynamics of interlayer coupling have been investigated using picosecond acoustic or strain pulses and probed by femtosecond optical pulses. The longitudinal strain pulses induce magnetization precession around the effective magnetic field in magnetic films. The interlayer coupling influences the magnetization precession behavior of the target layer due to the bottom/buffer layer. Three cases with different spacer thickness (5, 3 and 1 nm) have been studied. The experimental results show the weak and strong coupling between the ferromagnetic transition films across the spacer layer.

The femtosecond optical pulses can be used to induce the demagnetization in ferromagnetic transition metals. It was first shown by the Strasbourg group in 1996 (Bigot et al. PRL 76, 22, 4250). The underlying physics for the ultrafast demagnetization has been the topic of interest for long. Here, the primary instants of the ultrafast demagnetization have been investigated using 10 fs optical pulses in ferromagnetic transition metals (Ni and Co). The signals corresponding to the coherent magneto-optical processes, thermalization of spins and relaxation of spins to lattices have been resolved. The exponential time constants of 34 and 25 fs for the thermalization of spins in Ni and Co respectively have been measured.

Host: Franz Kärtner, CFEL-UX seminar