

Séminaire SOLEIL

Laser induced magnetization dynamics : from angular momentum dissipation to ultrafast spin transfer

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Grand Amphi - SOLEIL**

All-optical techniques exploiting femtosecond laser have opened the way towards the exploration of the ultimate limits of magnetization dynamics. It has been found that magnetic order in ferromagnetic transition metals can be quenched within a few hundred femtoseconds after laser heating. Because the time scale at which the magnetic order parameter changes is of the same order of magnitude as the thermalization time, i.e, the time at which the optically excited hot electrons equilibrate with the Fermi sea of electrons, it has been often thought that hot electrons are crucial in the process of fast laser-induced magnetization dynamics. Nevertheless, a quantitative microscopic interpretation of the phenomena at the sub-ps level has remained a mystery until recently. The conservation of angular momentum is believed to be the key issue in understanding microscopic processes involved in the ultrafast loss of magnetization. During the first part of this talk, I will introduce a quantitative microscopic model for laser-induced demagnetization that only relies on a fully thermalized sea of electrons. The key element of the model is the finite (Elliot-Yafet) spin flip scattering probability upon electron-phonon momentum scattering. A quantitative agreement with experimentally observed laser-induced magnetization dynamics on different magnetic materials and for different laser fluences is reported.

In a second part, I will demonstrate how to speed up the sub-ps demagnetization after laser excitation by controlling the spin angular momentum dissipation in [Co/Pt]_n multilayers. We believe that controlling the magnetization dynamics in engineered structures by selectively opening a channel for direct spin transfer offers the remarkable possibility to bring spin polarized transport phenomena to the sub-picosecond, non-equilibrium regime.

Formalités d'entrée : accès libre dans l'amphi du Pavillon d'Accueil. Si la manifestation a lieu dans le Grand Amphi Soleil du Bâtiment Central, merci de vous munir d'une pièce d'identité (à échanger à l'accueil contre un badge d'accès).

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