

SEMINAIRE LIDYL

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(LIDYL/DICO)

Le Jeudi 31 Mars 2022 à 11h00
Orme des Merisiers, Bât.701, Pièce 17 (salle de séminaires)

Sensing fundamental interactions in solids with attosecond pulses: landscape and perspectives

Solids organize in many different ways, giving rise to distinct phases of matter, such as insulators, metals, magnets or superconductors. This richness of behaviors can be traced back to numerous fundamental interactions: for instance, how electrons repel each other, how spins tend to align together, or how lattice movements shift energetic levels. Ultrafast spectroscopy attempts to probe these interactions, by measuring how each of these degrees of freedom reacts to an external stimulus - such as a laser pulse.

In this talk, I will present how pulses of attosecond duration ($=10^{-18}$ s) can be used to probe dynamics in condensed matter with great detail. Recently performed attosecond transient absorption and reflectivity experiments will show how the dynamics of electronic charges and their interaction with the lattice can be probed on timescales shorter than a femtosecond. I will also present the development of a new state-of-the-art beamline dedicated to this topic, installed on the ATTOLab facility at LIDYL.

Finally, this seminar will give me the opportunity to introduce a new research direction of our group, which will be supported by the recently awarded ERC Starting Grant *Spinfield*. We will focus on an unanswered enigma in light-solid interactions: can the electromagnetic field of light directly couple with the electronic spins of a solid? Can we find coherent and direct interactions that allow us to manipulate quantities such as the magnetization of a solid, directly with the oscillations of the laser field? To answer these questions, we will rely on both existing and new tools offered by attosecond science, aiming to unveil fundamental interactions that have yet to be observed.