Ultrafast magnetization dynamics of composite heterostructures at the nanometric scale

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The study and control of magnetization in magnetic materials using femtosecond laser pulses is of great interest for both fundamental and applications points of view. Indeed sub-picosecond spin dynamics could represent a significant improvement of the speed of data processing technologies [1]. With most recent transistors reaching down 5 nm in thickness, new questions are raised on how to achieve viable THz magnetic control on heterostructures thick of a few atoms only.

The proposed experimental thesis work aims at addressing some of these questions by following two axis. The first one will be to investigate the magnetic response of nano-metrically thin heterostructures made of well-known 3d magnetic materials such as Fe, Co and Ni and their alloys [2-3]. The second axis will focus on thin heterostructures including recently discovered 2D magnets such as transition metal phosphorus trichalcogenides (XPS_3 with X=Fe, Co,...). In both axis, the emphasis will be made on understanding the interplay of the electrons, spins and phonons ultrafast dynamics inside and between each constituent, depending on nanostructure geometry.

The successful candidate will take part to the life of the team and will acquire high-level skills in ultrafast spectroscopy and magnetism in a friendly and supportive work environment. They will have access to optical techniques that have been developed in our team over the years such as visible and XUV pump-probe magneto-optical Kerr experiments and static visible magneto optical characterization tools [4-6].

We are looking for a highly motivated candidate with a good background in condensed matter physics and light-matter interaction processes, and with a strong interest in experimental physics.

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