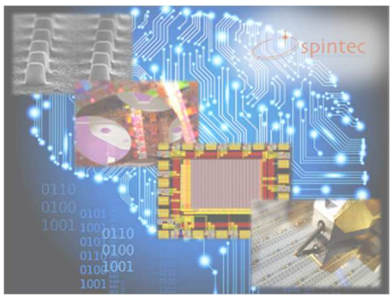
spintec
SPIN IN ELECTRONICS

Recruiting a 2-year postdoc position on modelling of all optical switching using light carrying orbital momentum



SPINTEC

Positioned at the crossroad of science and technology, **SPINTEC** (**SPINtronique et TEchnologie des Composants**, http://www.spintec.fr) is one of the leading spintronics research laboratories worldwide. SPINTEC was created in 2002 and rapidly expanded to currently exceed 100 persons, of which 48 permanent staff from CEA, CNRS and Grenoble-Alpes University. The lab aims at bridging the gap between fundamental research and applications in spin electronics. As such, the outcome of the laboratory is not only scientific publications and communications at international conferences, but also a consistent patent portfolio and implementation of relevant functional demonstrators and device nanofabrication. The lab has launched four start-up companies in the past 12 years. This synergy has placed SPINTEC at the forefront of spintronics research, having actively contributed to the emergence in industry of spintronic memories called MRAM, on which the laboratory holds key patents.

SPINTEC benefits from an idea local environment with a large spectrum of opportunities:

- SPINTEC belongs with the Interdisciplinary Research Institute of Grenoble (IRIG), gathering 10 laboratories with of total of 1000 researchers, technicians, doctoral and post-doctoral students. IRIG covers interdisciplinary skills (physics, chemistry, biology), and provides access to cutting-edge scientific and technological platforms such as PTA cleanroom, and nano-characterization PFNC.
- The Giant Campus Site (also called Scientific Presqu'Ile) offers an exceptional scientific environment with partners such as CEA-LETI, Néel Institute and major European facilities (ESRF and ILL on the EPN Campus).
- The entire Campus of Grenoble Alpes University, whose excellence was recently recognized by the national IDEX award, bears a collective dynamics of research challenges in all fields of knowledge.

Grenoble is a cosmopolitan city at the heart of the French Alps. One out of five people living there works in the field of research, innovation or higher education. In addition, Grenoble offers various cultural and sportive opportunities all year round.

CONTEXT

The manipulation of magnetization by ps or fs light pulses has become a very exciting topic nowadays opening routes towards ultrafast magnetization control. To date, most of the light-spin interaction studies made use of spin angular momentum carried by the light (Fig.1(a)), either for control or probing. The proposed position is part of an ANR project in which we consider a yet unexplored opportunity, offered by the tremendous recent progress in the shaping of exotic light beams in 3D in the visible and XUV. For instance, ultrashort light beams carrying orbital angular momentum (OAM) (Fig.1(b)), which corresponds to featuring a helical wave front, are available today in the Vis-IR and XUV spectral ranges.

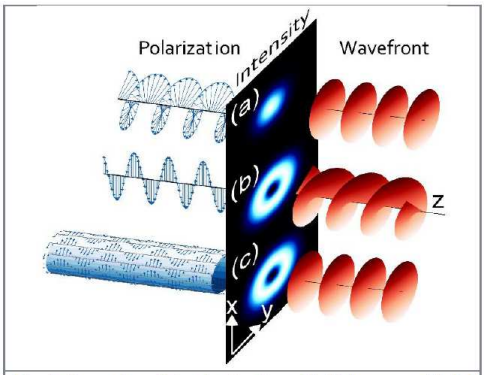


Fig. 1: Examples of simply structured light beams, with (a) spin angular momentum, (b) orbital angular momentum, and (c) azimuthal polarization. Z is the propagation axis. Blue arrows are the polarization vectors (electric field), blue maps represent the intensity in a given transverse plane, and the wavefronts are shown in orange.

Theory predicts that structured materials have different optical properties for beams of opposite OAM, yielding novel forms of helicoidal dichroisms (HD) (different from the regular circular dichroism), but applications remain scant and specific. Likewise, the inverse effect, i.e. the capability of a beam carrying OAM to modify the magnetization of a material, is still a completely open question. The overall objective of the ANR project is to set a universal framework describing the interaction of structured light and magnetic materials, in particular those with non-uniform structures.

POSITION

In this frame, the post-doctoral position open at SPINTEC will be focused on the modelling of the ultrafast magnetization dynamics induced by helicoidally polarized light. For the moment, the underlying physics needs to be developed. Effects such as heating dynamics (3 temperature model) and torque exerted by light with OAM on magnetization will have to be included in Landau-Lifshitz-Gilbert (or Bloch) equation describing the magnetization dynamics. Simulations will then be carried out and confronted to the experimental results from our partners (CEA-Saclay/Lidyl, SOLEIL, LCF Palaiseau, INSP Paris) with the purpose to get a complete picture of this particular interaction between magnetization and light carrying OAM.

The post-doc is expected to have a good ability in coding, good experience in micromagnetic simulations, and enjoy teamwork.

How to apply: Applicant should send their CV including publications list to

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