

Studies of the Magnetic and Electrical Properties of Magnetic Topological Insulators

Keywords: topological insulator, magnetism, 2D electron states

Scientific description:

Three-dimensional (3D) Topological Insulators are the subject of a great attention due to the simultaneous presence of massive semiconductor electronic states and massless surface states. These bidimensional surface states are associated with a Dirac cone, protected by invariance by reversal of the time. Two surface spin currents then appear, protected from defects, and forming helical states of polarization and opposite directions of propagation. For instance, a signature of this states can be observed in the electrical conductivity versus magnetic field (cf. Figure 1).

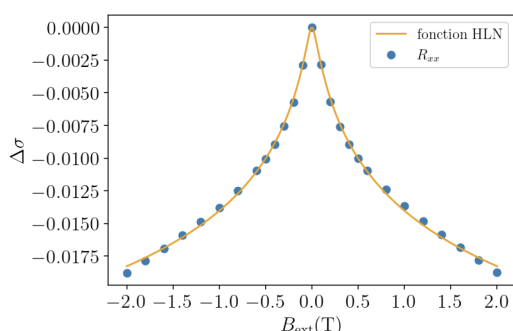


Figure 1. Magneto-conductivity of a Bi_2Se_3 topological insulator film versus magnetic field, applied perpendicular to the surface states. The fitting line corresponds to a 2D Hikami-Larkin-Nagaoka model.

The recent discovery of magnetic compounds opens the door to the creation of polarized currents, called chiral, selectively chosen and presenting an original spin texturing. The purpose of this internship will be to study the magnetic and electrical properties of these new materials, synthesized by epitaxy in the laboratory (MnSb_2Te_4 , $\text{Sn}_{1-x}\text{Cr}_x\text{Te}$, $\text{Bi}_{2-x}\text{Cr}_x\text{Se}_3$, etc.). Modeling work should make it possible to trace the magnetic order of these compounds. The trainee will benefit from the facilities and platforms available at INSP (SQUID, PPMS for magneto-transport, cryogenic devices, clean room).

Techniques/methods in use: Magneto-transport measurements (PPMS) / Magnetometry (SQUID) / lithography, contact deposit (Clean Room)

Applicant skills: A good background in solid physics and quantum physics is not mandatory but is appreciated. A strong taste for experimental activities is recommended.

Industrial partnership: N

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Possibility for a Doctoral thesis: Y (ED PIF contract)