SÉMINAIRE

Mercredi 7 février 2018 à 11h15

Orme des Merisiers SPEC, Salle Itzykson, Bât.774

Alexander BRINKMAN

MESA+ Institute for Nanotechnology, University of Twente, the Netherlands

Bi based topological materials

Strong spin-orbit interaction, such as due to heavy Bi atoms, can invert electronic bands in solids. This gives rise to topological surface states or topological semi-metallic bulk states with linear dispersion relation as for massless particles. The states are characterized by a coupling between electron spin and propagation direction. This reduced spin degree of freedom has technological advantages for the realization of spintronic applications or for topological quantum computation. I will give one example of each of these two fields after having introduced the crystal/film growth and device fabrication aspects of this class of materials.

First, we probe the spin-momentum locking by measuring spin accumulation due to charge current in the stoichiometric topological insulator BiSbTeSe2. In high magnetic field, quantum Hall measurements reveal that we can gate-tune the top and bottom topological surface states independently and throughout the Dirac cones. An interesting coupling between counter-propagating quantum Hall edge channels is revealed in high magnetic field.

Secondly, when a topological material with spin-momentum locking is used as an interlayer between two superconductors, Andreev bound states are created at zero energy. For the Dirac semimetal Bi0.97Sb0.03, the relation between the supercurrent and the phase difference between the superconducting electrodes is shown to have the required 4p periodic component. The prospects for Majorana based quantum experiments will be discussed.

A coffee break will be served at 11h00. The seminar will be given in English.