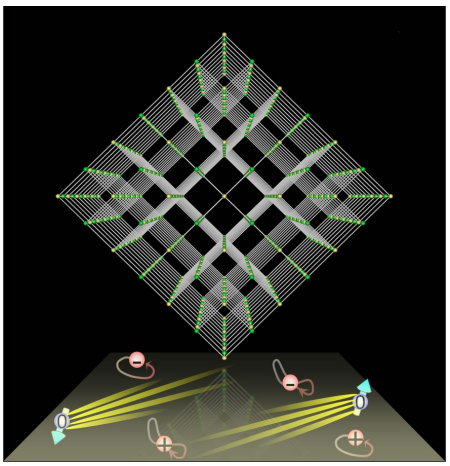
13 giu 2014
ore 11:00

SEMINARIO

Consiglio Nazionale delle Ricerche
Istituto per l'Energetica e le Interfasi
U.O.S. di Milano

Coexistence of Massless and Massive Dirac Fermions in Topological Crystalline Insulators

Prof. Vidya Madhavan
Boston College, Department of Physics,
140 Commonwealth Ave, Chestnut Hill, MA 02467, USA



Electrons in free space have a well-defined mass. Recently, a new class of materials called topological insulators were discovered, where the low energy electrons have zero mass. In fact, these electrons can be described by the same massless Dirac equation that is used to describe relativistic particles travelling close to the speed of light. In this talk I will describe our recent experimental and theoretical investigations of a class of materials called Topological Crystalline Insulators (TCIs) [1]. TCIs are recently discovered topological materials [2,3] where topology and crystal symmetry intertwine to create linearly dispersing Fermions similar to graphene. To study this material we used a scanning tunneling microscope. With the help of our high-resolution data, I will show how zero-mass electrons and massive electrons can coexist in the same material. I will discuss the conditions to obtain these zero mass electrons as well the method to impart a controllable mass to the particles and show how our studies create a path to engineering the Dirac band gap and realizing interaction-driven topological quantum phenomena in TCIs.

[1] Y. Okada, et.al, Observation of Dirac node formation and mass acquisition in a topological crystalline insulator, Science 341, 1496-1499 (2013)
[2] L. Fu, Topological Crystalline Insulators. Phys. Rev. Lett. 106, 106802 (2011)
[3] T. H. Hsieh et al., Topological crystalline insulators in the SnTe material class. Nat. Commun. 3, 982 (2012)

sala Q4 P1 16
via R. Cozzi, 53
20125 Milano

Informazioni

dr. Stefano Zapperi
tel.: +39 02 66173 385
e-mail: stefano.zapperi@ieni.cnr.it