

FM 70: Special Session: Topology

Time: Thursday 11:00–13:00

Location: Audi Max

Invited Talk FM 70.1 Thu 11:00 Audi Max
Hofstadter Topology — •BOGDAN A. BERNEVIG — Princeton University, Department of Physics, Princeton, NJ, USA

A new type of topological stars arise in twisted Moire compounds. We show how they are different from bulk sample topology, as well as how they can be achieved in moderate magnetic fields under Moire conditions.

Invited Talk FM 70.2 Thu 11:30 Audi Max
Topological superconductors and Majorana fermions — •YOICHI ANDO — Physics Institute II, University of Cologne, 50937 Cologne, Germany

In this talk, I will give a general introduction to topological superconductivity and Majorana fermions [1], and explain why spin-orbit coupling is useful for generating such novel states of matter. The distinction between dispersive Majorana fermions and localized Majorana zero modes is emphasized; the former are mobile quasiparticles to contribute to novel transport properties in superconducting surface/edge, while the latter obey the non-Abelian statistics and can be used for topological quantum computing. As a material class to realize the former, I will elaborate on the nematic topological superconductors derived from the topological insulator Bi_2Se_3 . For the localized Majorana zero modes, I will introduce the concept for using them for topological quantum computing and present our efforts to realize them in proximitized topological insulators.

[1] M. Sato and Y. Ando, Rep. Prog. Phys. **80**, 076501 (2017).

Invited Talk FM 70.3 Thu 12:00 Audi Max
Majorana bound states in hybrid superconductor-semiconductor systems — •KARSTEN FLENSBERG — Niels Bohr

Institute, University of Copenhagen

It has been theoretically predicted that topological superconductivity can be engineered in hybrid superconductor-semiconductor systems and many experiments have by now realized such candidate systems. In the talk, I will discuss ways to discern Majorana bound states from other non-topological states in transport measurement. Moreover, the talk will discuss proposals for the steps towards showing the nonlocal and nonabelian physics that is theoretically expected for a system of Majorana bound states.

Invited Talk FM 70.4 Thu 12:30 Audi Max
Status of the search for Majorana zero modes in semiconductor nanowires — •SERGEY FROLOV — University of Pittsburgh

Majorana modes are non-trivial quantum excitations that have remarkable topological properties and can be used to protect quantum information against decoherence. Tunneling spectroscopy measurements on one-dimensional superconducting hybrid materials have revealed signatures of Majorana zero modes which are the edge states of a bulk topological superconducting phase. We couple strong spin-orbit semiconductor InSb nanowires to conventional superconductors (NbTiN, Al) to obtain additional signatures of Majorana modes and to explore the topological phase transition. A potent alternative explanation for many of the recent experimental Majorana reports is that a non-topological Andreev state localizes near the end of a nanowire. We compare Andreev and Majorana modes and investigate ways to clearly distinguish the two phenomena. We explore new materials combinations in the broad superconductor-semiconductor family to find a perfect pair for the realization of topological quantum bits. I will present our progress towards assembling the apparatus for the future Majorana fusion and braiding experiments.