Searching for Majorana zero modes in two-dimensional systems

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Abstract

Majorana zero modes have been proposed and observed in several solid state systems. This talk will present the current progress and focus on two-dimensional (2D) platforms with strong spin-orbit coupling. First, we study superconductivity mediated by the edge-modes of InAs/GaSb, a 2D topological insulator. Using superconducting quantum interference, we demonstrate tuning between edge-dominated and bulk-dominated superconducting transport regimes as a function of electrostatic gating [1]. Secondly, we investigate the phase diagram of InAs/GaSb by measuring dual-gated Hall bars [2]. Most importantly, by tuning the band alignment and Fermi level through top and back gates, we explore the transition between the trivial and topological insulating phases characterized by a normal gap and a hybridization gap, respectively. Thirdly, we fabricate quantum point contacts on InSb quantum wells and realize quantized conductance from the ballistic transport. In a vector magnet,