Sonderforschungsbereich 689
Spinphänomene in reduzierten Dimensionen

Seminarankündigung

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Thema:
Majorana Fermions and parity crossings in spin-polarized normal metal nanostructures and magnetic atomic chains in proximity to a superconductor

In this talk, I will focus on Majorana fermions and topologically protected crossings of Andreev bound states on two platforms: (i) in spin-polarized normal-superconductor hybrid structures and (ii) in magnetic atomic chains on superconductors. Topologically protected crossings, signaling a change in the ground state fermion parity, became the focus of recent attention as they are regarded to be precursors to Majorana fermions that appear in the long-wire/chain limit. I will discuss how a topological state can be induced from regular or irregular scattering in (i) Rashba wires or (ii) magnetic atomic chains in proximity to an s-wave superconductor. I will next show how to relate the topological properties of these nanostructures to their normal state properties. Next, I will discuss the correlation between parity-crossings in the superconducting state and the normal state properties of a hybrid nanostructure and show that the crossing points as well as their statistics are universal and are essentially described by their normal-state spectra. I will discuss formulae for the mean spacing between parity crossings as well as the corresponding crossing statistics in disordered wires/chains/cavities. I will finally discuss under what conditions these crossings signal Majorana fermions.

Ansprechpartner: K. Richter