Jozef Stefan Institute, Department of Theoretical Physics

Solid State Group Seminars

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Intrinsic versus proximity induced zero energy modes in a superconductor with a ferromagnetic adatom chain

Recently an experiment was reported, where localized zero energy modes were observed in the system of a ferromagnetic adatoms on top of a conventional superconductor using scanning tunneling microscope. The results indicate the detection of the Majorana zero energy states. After a short presentation of the experiment I will present a simple 1D system, Kitaev's chain, where the unpaired Majorana fermions are found at the end of a quantum wire. In the main part I will present the Majorana zero energy modes (MZEM) that occur in a conventional superconductor with a ferromagnetic adatom chain in the presence of Rashba spin-orbit interaction. I will assume a classical adatom magnetic moments and consider both proximity induced and intrinsic superconducting order. By exactly solving Bogoliubov de Gennes (BdG) equations in real space, I identify parametric regimes with the zero energy modes, which occur in both cases. In comparison to proximity induced superconductivity, is the region with MZEM shifted from the band edge to smaller chemical potential. This is connected to the decrease of the average gap function with increasing chemical potential. I will discuss similarities and differences between the MZEM for the two superconducting orders.

Thursday, March 26, 10:30am

Čajna soba F1, Jozef Stefan Institute