Abstract Submitted
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Anomalous resistivity peak in a ferromagnetic nanowire proximity-coupled to superconducting electrodes[1] SO TAKEI, VICTOR GALITSKI, University of Maryland — Motivated by the recent experiment of Wang et al. [Nature Physics 6, 389 (2010)], we study temperature-dependent transport in such a mesoscopic structure consisting of a ferromagnetic nanowire proximity-coupled to two conventional superconducting electrodes. It is assumed that the asymmetry in the tunneling barrier gives rise to the Rashba spin-orbit-coupling in the barrier that enables induced p-wave superconductivity in the ferromagnet to exist. First, we develop a microscopic theory of Andreev scattering at the spin-orbit-coupled interface, derive a set of self-consistent boundary conditions, and find an expression for the p-wave minigap in terms of the microscopic parameters of the contact. Second, we study temperature-dependence of the resistance near the superconducting transition and find that it should generally feature a fluctuation-induced peak. The upturn in resistance is related to the suppression of the single-particle density of states due to the formation of fluctuating pairs, whose tunneling is suppressed. We find a good agreement between the data and our fluctuation theory. Then, we discuss this and related setups involving ferromagnetic nanowires in the context of one-dimensional topological superconductors.

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