

Abstract Submitted
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Superconductivity and Majorana fermion creation at the quantum spin Hall insulator edge ANNICA M. BLACK-SCHAFFER, NORDITA
— We focus on properties related to Majorana fermion creation in a self-consistent study of a microscopic interface between a quantum spin Hall insulator (QSHI) and a superconductor (SC). For a spin-singlet s -wave SC we show that large odd-in-momentum, or p -wave, order parameters exist for all doping levels of the QSHI and that they can be related to different spinless Cooper pair amplitudes. This result demonstrates that it is natural that the Majorana mode at a SC-ferromagnet (SF) interface survives even at zero doping. Despite the induced p -wave order parameters, the induced superconducting gap in the QSHI always retains its s -wave character, thus validating the commonly used effective model for superconductivity in a topological insulator. We also self-consistently model an SFS Josephson junction along the QSHI edge and report on Majorana mode occurrence in the junction, the current-phase relation, and novel odd-frequency spin-triplet correlations.

Annica M. Black-Schaffer
NORDITA

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