

Abstract Submitted
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Switching Current Distributions in Superconductor–Topological Insulator–Superconductor Junctions ANDREW MURPHY, CAN ZHANG, ERIK HUEMILLER, Univ of Illinois - Urbana, SEONGSHIK OH, Rutgers University, JAMES ECKSTEIN, DALE VAN HARLINGEN, ALEXEY BEZRYADIN, Univ of Illinois - Urbana — It has been proposed that localized Majorana fermion (MF) modes can exist in lateral Josephson junctions with a 3D-topological insulator barrier at locations at which the phase difference across the junction is an odd multiple of π . These states enter the junctions bound to the nodes of the Josephson vortices as a perpendicular magnetic field is increased. Each mode contributes a local 4π -periodic $\sin(\varphi/2)$ -component to the junction’s current-phase relation, adding to the usual $\sin(\varphi)$ dependence. The sign of this new term encodes the parity of the Majorana pair. As a way to detect these states and measure their parity, we study the distribution of switching currents in Nb-Bi₂Se₃-Nb junctions fabricated on thin Bi₂Se₃ films in which the superconductivity is induced by a pair of closely spaced Nb electrodes. We expect that such measurements will be sensitive to the parity of the MFs, yielding a splitting of the distribution. Preliminary measurements of the critical current distributions show the onset of unusual features when the magnetic field is increased which we are analyzing to determine if they may arise from Majorana fermions in the junctions.

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