Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Magnetic Field Response and Chiral Symmetry of Time Reversal Invariant Topological Superconductors EUGEN DUMITRESCU, Clemson University, JAY D. SAU, University of Maryland, SUMTANTA TEWARI, Clemson University — We study the magnetic ?eld response of the Majorana Kramers pairs of a one-dimensional time-reversal invariant (TRI) superconductors (class DIII) with or without a coexisting chirality symmetry. For unbroken TR and chirality invariance the parameter regimes for nontrivial values of the (Z_2) DIII-invariant and the (Z) BDI chiral invariant coincide. However, broken TR may or may not be accompanied by broken chirality, and if chiral symmetry is unbroken the pair of Majorana fermions (MFs) at a given end survives the loss of TR symmetry in an entire plane perpendicular to the spin-orbit coupling field. Conversely, we show that broken chirality may or may not be accompanied by broken TR, and if TR is unbroken, the pair of MFs survives the loss of broken chirality. In addition to explaining the anomalous magnetic field response of all the DIII class TS systems proposed in the literature, we provide a realistic route to engineer a "true" TR-invariant TS, whose pair of MFs at each end is split by an applied Zeeman field in arbitrary direction. We also prove that, quite generally, the splitting of the MFs by TR-breaking fields in TRI superconductors is highly anisotropic in spin space, even in the absence of the topological chiral symmetry.

Eugen Dumitrescu
Clemson University

Date submitted: 14 Nov 2013 Electronic form version 1.4