Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Emergent Supersymmetry in Topological Superconductors TARUN GROVER, Kavli Institute for Theoretical Physics, DONNA SHENG, Cal State University Northridge , ASHVIN VISHWANATH, University of California Berkeley — In the absence of interactions, topological superconductors (TSC) host helical Majorana fermion edge states protected by time reversal symmetry. Increasing interactions can lead to spontaneous magnetic order at the boundary. We show that the associated quantum phase transition, if continuous, has emergent space-time supersymmetry at low energies. The magnetic order parameter field is identified as the superpartner of the Majorana fermions. These results are obtained using field theoretical arguments and are verified by numerical DMRG solution of a lattice model that mimics the physics of the phase transition. The emergent supersymmetry, accessed by tuning a single parameter, has striking consequences such as an exact relation between the correlation functions of fermions and those of the order parameter. Similar results are argued to hold for the 2+1 dimensional boundary of a bulk topological superconductor. Generalization to topological insulator surfaces will be mentioned.

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Date submitted: 09 Nov 2012 Electronic form version 1.4