Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Time-reversal invariant topological superconductivity in doped Weyl semimetals[1] PAVAN HOSUR, Stanford Univ, XI DAI, ZHONG FANG, Institute of Physics, Chinese Academy of Sciences, XIAO-LIANG QI, Stanford Univ — Time-reversal invariant topological superconductors are a new state of matter which have a bulk superconducting gap and robust Majorana fermion surface states. These have not yet been realized in solid state systems. In this paper, we propose that this state can be realized in doped Weyl semimetals or Weyl metals. The Fermi surfaces of a Weyl metal carry Chern numbers, which is a required ingredient for such a topological superconductor. By applying the fluctuation-exchange approach to a generic model of time-reversal invariant Dirac and Weyl semimetals, we investigate what microscopic interactions can supply the other ingredient, viz., sign changing of the superconducting gap function between Fermi surfaces with opposite Chern numbers. We find that if the normal state is inversion symmetric, onsite repulsive and exchange interactions induce various nodal phases as well as a small region of topological superconductivity on the phase diagram. Unlike the He3B topological superconductor, the phase here does not rely on any special momentum dependence of the pairing amplitude. Breaking inversion symmetry precludes some of the nodal phases and the topological superconductor becomes much more prominent, especially at large ferromagnetic interaction.

[1]We acknowledge support from the David and Lucile Packard Foundation, the Department of Energy Office of Basic Sciences, National Science Foundation, National Science Foundation of China and 973 Program of China for financial support

Pavan Hosur
Stanford Univ

Date submitted: 14 Nov 2014 Electronic form version 1.4