Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Inhomogeneous Topological Superfluidity in One-Dimensional Spin-Orbit-Coupled Fermi Gases CHUN CHEN, University of Minnesota — We theoretically predict an exotic topological superfluid state with a spatially modulated pairing gap in one-dimensional spin-orbit-coupled Fermi gases. This inhomogeneous topological superfluidity is induced by applying simultaneously a perpendicular Zeeman magnetic field and an equally weighted Rashba and Dresselhaus spin-orbit coupling in one-dimensional optical lattices. Based on the self-consistent Bogoliubov-de Gennes theory, we confirm that this novel topological phase is a unique condensation of Cooper pairs, which manifests the interplay between the inhomogeneity of a superfluid and its nontrivial topological structure. The properties of the emergent Majorana bound states are investigated in detail by examining the associated Z_2 topological number, the eigenenergy and density of states spectra, as well as the wave functions of the localized Majorana end modes. The experimental feasibility of observing this new topological state of matter is also discussed.

Chun Chen
University of Minnesota

Date submitted: 30 Dec 2013 Electronic form version 1.4