Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Effect of thermal fluctuations in topological p-wave superconductors BELA BAUER, ROMAN M. LUTCHYN, Station Q, Microsoft Research, MATTHEW B. HASTINGS, Duke University, Department of Physics, MATTHIAS TROYER, Theoretische Physik, ETH Zurich — We study the effect of thermal fluctuations on the topological stability of chiral p-wave superconductors. We consider two models of superconductors: spinless and spinful with a focus on topological properties and Majorana zero-energy modes. We show that proliferation of vortex-antivortex pairs above the Kosterlitz-Thouless temperature T_{KT} drives the transition from a thermal Quantum Hall insulator to a thermal metal/insulator, and dramatically modifies the ground-state degeneracy splitting. Therefore, in order to utilize 2D chiral p-wave superconductors for topological quantum computing, the temperature should be much smaller than T_{KT}. Within the spinful chiral p-wave model, we also investigate the interplay between half-quantum vortices carrying Majorana zero-energy modes and full-quantum vortices having trivial topological charge, and discuss topological properties of half-quantum vortices in the background of proliferating full-quantum vortices.

Bela Bauer
Station Q, Microsoft Research, Santa Barbara

Date submitted: 17 Dec 2012 Electronic form version 1.4