Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Vortices and vortex states of Rashba spin-orbit coupled condensates PREDRAG NIKOLIC, George Mason Univ — The Rashba spin-orbit coupling in two spatial dimensions is captured by a static SU(2) gauge field with a nonzero magnetic Yang-Mills flux. This SU(2) analogue of magnetic field enables two-dimensional topological insulators (TI) reminiscent of integer quantum Hall states. An outstanding question is whether non-Abelian fractional TIs could exist as well. We explore this from the point of view that quantum melting of a vortex lattice can produce fractional incompressible liquids when the number of flux quanta per particle is not small. Physical systems in which an SU(2) vortex lattice melting could perhaps be arranged include two or three-component bosonic cold atoms in optical lattices, as well as solid-state heterostructures with a conventional or Kondo TI quantum well. This talk will discuss the types of vortices and vortex lattices that could exist in these systems as "parent" states to fractional quantum liquids. Analytical arguments based on conservation laws reveal several possibilities for vortex states, some of which do not break the time-reversal symmetry. We will present mean-field numerical results that paint certain vortex states as excellent metastable or ground states of a microscopic lattice model.

Predrag Nikolic
George Mason Univ

Date submitted: 14 Nov 2013 Electronic form version 1.4