Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Exploration of the Exact Bose-Fermi Mixture Phase Diagram via Quantum Monte Carlo KYUNG DUK YOON, Salisbury School, Salisbury, CT — Following unprecedented success studying Bose and Fermi gases in optical lattices, atomic physicists are becoming increasingly interested in Bose-Fermi mixtures. It has been suggested that mixtures possess a complex phase diagram, containing a number of intriguing phases, including two-particle superfluids, supersolids, and density waves. Nevertheless, much of this phase diagram remains unknown because of algorithmic limitations. In this work, we explore the exact phase diagram of Bose-Fermi mixtures at finite temperatures in the hopes of uncovering Bose-Fermi density waves using a novel Auxiliary Field Quantum Monte Carlo (AFQMC) technique. Our AFQMC method expresses the Bose-Fermi partition function as a determinant that can be sampled to obtain accurate results throughout the phase diagram. Based upon this determinant, we calculate several correlation functions to look for signatures of mixture density waves. For certain system sizes and in certain parameter regimes, we compare and contrast with Exact Diagonalization and Mean Field Theory. Here, we begin this study by focusing on one-dimensional systems; future work will be extended to multidimensional systems were AFQMC is expected to be the only method capable of studying them.

Kyung Duk Yoon
Salisbury School, Salisbury, CT

Date submitted: 05 Nov 2012 Electronic form version 1.4