Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Spin-orbit coupling in the strongly interacting Fermi gas: an exact quantum Monte Carlo study[1] PETER ROSENBERG, HAO SHI, SIMONE CHIESA, SHIWEI ZHANG, College of William and Mary — Spin-orbit coupling (SOC) plays an essential role in a variety of intriguing condensed matter phenomena, including the quantum Hall effect, and topological insulators and superconductors. The recent experimental realization of spin-orbit coupled Fermi gases provides a unique opportunity to study the effects of SOC in a tunable, disorder-free system. Motivated by this experimental progress, we present here the first exact numerical results on the two-dimensional, unpolarized, uniform Fermi gas with attractive interactions and Rashba SOC. Using auxiliary-field quantum Monte Carlo and incorporating recent algorithmic advances, we carry out exact calculations on sufficiently large system sizes to provide accurate results systematically as a function of experimental parameters. We obtain the equation of state, study the spin behavior and momentum distribution, and examine the interplay of SOC and pairing in real and momentum space. Our results help illuminate the rich pairing structure induced by SOC, and provide important guidance to future experimental efforts.

[1]Supported by DOE SciDAC and NSF

Peter Rosenberg
William
Mary Coll

Date submitted: 06 Nov 2015 Electronic form version 1.4