Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Spectral functions in ultracold Fermi gases[1] WILLIAM SCHNEIDER, MOHIT RANDERIA, The Ohio State University — We study the fermion spectral function in the superfluid state across the BEC-BCS crossover and in the normal Fermi liquid phase in highly imbalanced Fermi gases. We focus on features that can be measured in momentum-resolved radio frequency spectroscopy experiments. We go beyond mean field theory and include the effects of Gaussian order parameter fluctuations in a manner that gives excellent agreement with asymptotically exact results for the $T = 0$ equation of state in the BEC and BCS limits, as well as quantum Monte Carlo (QMC) results near unitarity. We show that sharp Bogoliubov quasiparticles, with a substantial coherent spectral weight, exist near unitarity. We argue that this is true generally even beyond the Gaussian approximation. In addition, quasiparticle scattering and interaction with collective modes produces incoherent spectral weight. We show that the dispersion is strongly renormalized at unitarity with its minimum shifted up from its mean field value $\sqrt{2m\mu}$ and compare our results with existing QMC data. We discuss how the spectral function changes qualitatively compared with its mean field form as $1/(k_F a)$ increases and the chemical potential changes sign.

[1]Supported by NSF-DMR 0706203 and ARO W911NF-08-1-0338.

William Schneider
The Ohio State University

Date submitted: 19 Nov 2010 Electronic form version 1.4