

Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Short-range correlations and entropy in ultracold atomic Fermi gases ZHENHUA YU, Physics Department, the Ohio State University, GEORG BRUUN, GORDON BAYM — We relate short-range correlations in ultracold atomic Fermi gases to the entropy of the system over the entire temperature, T , vs. coupling strength, $1/kF$ a, plane. In the low temperature limit the entropy is dominated by phonon excitations and the correlations increase as T^4 . In the BEC limit, we calculate a boson model within the Bogoliubov approximation to show explicitly how phonons enhance the fermion correlations. In the high temperature limit, we show from the virial expansion that the correlations decrease as $1/T$. By interpolating between the two limits, we predict that the correlations reach a maximum at a finite temperature. We infer the general structure of the isentropes of the Fermi gas in the $T, 1/kF$ a plane, and the temperature dependence of the correlations in the unitary, BEC, and BCS limits. Our results compare well with measurements of the correlations via photoassociation experiments at higher temperatures.

Zhenhua Yu
Physics Department, the Ohio State University

Date submitted: 19 Nov 2010

Electronic form version 1.4