Abstract Submitted
for the MAR15 Meeting of
The American Physical Society

Stoner ferromagnetism of a strongly interacting Fermi gas in the quasirepulsive regime LIANYI HE, Theoretical Division, Los Alamos National Laboratory, Los Alamos, NM 87545, USA, XIA-JI LIU, Centre for Quantum and Optical Science, Swinburne University of Technology, Melbourne 3122, Australia, XU-GUANG HUANG, Physics Department, Fudan University, Shanghai 200433, China, JOSEPH CARLSON, Theoretical Division, Los Alamos National Laboratory, Los Alamos, NM 87545, USA, HUI HU, Centre for Quantum and Optical Science, Swinburne University of Technology, Melbourne 3122, Australia — Recent advances in rapidly quenched ultracold atomic Fermi gases near a Feshbach resonance arise a number of interesting problems, in the context of observing the long-sought Stoner ferromagnetic phase transition. The possibility of experimentally obtaining a "quasirepulsive" regime in the upper branch of the energy spectrum due to the rapid quench is currently debated and theoretically, the Stoner transition has mainly been investigated at zero temperature or high polarization, due to the limited theoretical approaches in the strongly repulsive regime. Here, we develop a nonperturbative large-N expansion theory for a quasirepulsive Fermi gas near resonance and present a finite temperature phase diagram for its Stoner instability. Our results agree well with the known quantum Monte-Carlo simulations at zero temperature and recover the virial expansion prediction at high temperature for arbitrary interaction strengths. At resonance, we find that the unitary Fermi gas undergoes the Stoner transition at about 1.5TF, where TF is the Fermi degeneracy temperature.

Hui Hu
Centre for Quantum and Optical Science,
Swinburne University of Technology, Melbourne 3122, Australia

Date submitted: 14 Nov 2014 Electronic form version 1.4