Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Effects of disorder on the interacting Fermi gases in one-dimensional optical lattices[1] B. TANATAR, Physics Department, Bilkent University, 06800 Ankara, Turkey, GAO XIANLONG, Physics Department, Zhejiang Normal University, Jinhua, 321004 China, M. POLINI, M. P. TOSI, NEST-CNR-INFM and Scuola Normale Superiore I-56126 Pisa, Italy — Interacting two-component Fermi gases loaded in a one-dimensional (1D) lattice and subjected to an harmonic trapping potential exhibit interesting compound phases in which fluid regions coexist with local Mott-insulator and/or band-insulator regions. Motivated by experiments on cold atoms inside disordered optical lattices, we present a theoretical study of the effects of a random potential on these ground-state phases. We employ density-functional theory within the local-density approximation to determine the density distribution of fermions in these phases. The exchange-correlation potential is obtained from the Lieb-Wu exact solution of Fermi-Hubbard model. On-site disorder and harmonic trap are treated as external potentials. We find that disorder has two main effects: it destroys the local insulating regions if it is sufficiently strong compared with the on-site atom-atom repulsion, and it induces an anomaly in the compressibility at low density from quenching of percolation.

[1]B.T. is supported by TUBITAK (No. 106T052) and TUBA.

B. Tanatar
Physics Department, Bilkent University, 06800 Ankara, Turkey

Date submitted: 02 Dec 2007 Electronic form version 1.4