Abstract Submitted
for the MAR07 Meeting of
The American Physical Society

Luttinger theorem and Fermi liquid behavior close to a Feshbach resonance SERGIO GAUDIO, Department of Physics, Boston College and Universita′ La Sapienza, Roma, JASON JACKIEWICZ, Max Planck Institute, Katlenburg-Lindau, Germany, KEVIN BEDELL, Department of Physics, Boston College — Based on the results obtained in a previous paper [1], we derive the thermodynamic properties of a Fermi gas, deep into the quantum degenerate regime and provide a useful test for the validity of Luttinger theorem. We show that, if Luttinger theorem holds, a first order phase transition has to occur in the normal phase as a function of the interaction strength, U, as a consequence of a jump occurring in the compressibility, spin susceptibility and specific heat. The signature of the transition is given by the presence of a non-zero latent heat. We also show that a volume change occurs at finite temperatures from the BEC to the BCS side of the Feshbach resonance, in the normal phase. The transition has an end point close to the BCS critical temperature. Thus, observation of these properties will require suppression of the superfluid phase. Also we demonstrate that a paramagnetic system in equilibrium, close to a diverging scattering length, expels any applied magnetic field and as a consequence, there is no Clogston limit in the in the superfluid phase.

[1] cond-mat/0505306

Sergio Gaudio

Date submitted: 20 Nov 2006 Electronic form version 1.4