Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Precursors of 1D behavior for $D > 1$: evolution of the non-analytic correction to the Fermi-liquid behavior RONOJOY SAHA, DMITRII MASLOV, Dept. of Physics, University of Florida, Gainesville, Florida 32611-8440, USA — The Fermi-liquid forms of the specific heat ($C(T)$) and static spin susceptibility (χ_s) acquire universal non-analytic corrections[1] and the degree of non-analyticity increase inversely with the dimensionality. This predicts that the strongest non-analyticity in the specific heat should be found in 1D, however bosonization shows that $C(T)$ is linear in T in 1D. We resolve this paradox by showing that the general argument, for non-analyticity in $D > 1$ at the second order in the interaction, breaks down in 1D due to a subtle cancellation and the non-analytic $T \ln T$ term in 1D occurs at the *third* order for electrons with spin. We obtain the same result by considering the RG flow of the marginally irrelevant operator in the sine-Gordon theory. For spinless electrons, the non-analyticities in the particle-particle and particle-hole channels cancel out and the resulting $C(T)$ is linear in T. The singularity in the particle-hole channel causes non-analyticity in the spin susceptibility $\chi_s \propto \ln \max\{|Q|, |H|, T\}$ present at the second order[2]. [1]A.V. Chubukov and D.L. Maslov, Phys. Rev. B 68, 155113 (2003). [2]I.E. Dzyaloshinskii and A.I. Larkin, Sov. Phys. JETP 34, 422 (1972)

Ronojoy Saha
Dept. of Physics, University of Florida, Gainesville, Fl-32611-8440, USA

Date submitted: 28 Nov 2004 Electronic form version 1.4