Abstract Submitted
for the DAMOP09 Meeting of
The American Physical Society

Spin-incoherent Luttinger liquid regime of trapped Fermi gases SATYAN BHONGALE, PAATA KAKASHVILI, CARLOS BOLECH, HAN PU, Rice University — The Luttinger liquid phase has been the paradigm of low-energy physics in 1D systems for about half a century. This phase is characterized by the absence of fermionic quasiparticles even in the presence of well defined Fermi surfaces with the relevant modes of dispersion represented by bosonic spin and charge excitations propagating at different velocities. Very recently the so-called spin-incoherent Luttinger liquid has become an active area of research. In contrast with the spin-coherent Luttinger liquid, here the spin-incoherence results from the induced spin-spin interaction being the smallest energy scale in the system. Recent success in manipulating ultracold atomic systems allows one to realize such different strongly correlated regimes by tuning the inter atomic interaction strength and trap parameters. We show, while the spin-incoherent regime is hard to achieve in solid state setups, it is almost unavoidable in trapped atom configurations. Further, for probing such states, we identify the noise correlations of density fluctuations as a robust observable uniquely suitable in the context of trapped atomic gases to discriminate between these two regimes. Finally, we address the prospects of realizing and probing these phenomena experimentally using optical lattices.

Satyan Bhongale
Rice University

Date submitted: 20 Jan 2009 Electronic form version 1.4