Abstract Submitted
for the DAMOP15 Meeting of
The American Physical Society

Sudden expansion of the Lieb-Liniger gas from power-law traps KAREN KHERUNTSYAN, University of Queensland, A.S. CAMPBELL, D.M. GANGARDT, University of Birmingham — We study free expansion of an interacting one-dimensional Bose gas (described, in the uniform limit, by the integrable Lieb-Liniger model) in a confinement quench scenario of being suddenly released from the ground state of the trapping potential. We consider the general case of power-law traps and, by using the stationary phase and local density approximations, show that the long-time asymptotic density profile and the momentum distribution of the gas are determined by the initial distribution of Bethe rapidities (quasimomenta) and hence can be obtained from the solutions to the thermodynamic Bethe ansatz equations. For expansion from a harmonic trap, and in the limits of very weak and very strong interactions, we recover the known scaling solutions of the hydrodynamic approach corresponding to self-similar expansion. For all other power-law traps and arbitrary interaction strengths, the expansion is not self-similar and shows strong dependence of the shape variation of the density profile during the evolution on the trap anharmonicity. We also characterize dynamical fermionization of an expanding cloud in terms of its first- and second-order coherences describing phase and density fluctuations. [A. S. Campbell, D. M. Gangardt, and K. V. Kheruntsyan, arXiv:1501.01896].

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Date submitted: 21 Jan 2015 Electronic form version 1.4