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The effect of adiabaticity on strongly quenched Bose Einstein Condensates[1] HONG LING, Department of Physics and Astronomy, Rowan University, Glassboro, New Jersey 08028, USA, BEN KAIN, Department of Physics, College of the Holy Cross, Worcester, Massachussets 01610, USA — We study the properties of a Bose-Einstein condensate following a deep quench to a large scattering length during which the condensate fraction n_c changes with time. We construct a closed set of equations that highlight the role of the adiabaticity or equivalently, dn_c/dt, the rate change of n_c, which is to induce an (imaginary) effective interaction between quasiparticles. We show analytically that such a system supports a steady state characterized by a constant condensate density and a steady but periodically changing momentum distribution, whose time average is described exactly by the generalized Gibbs ensemble. We discuss how the n_c -induced effective interaction, which cannot be ignored on the grounds of the adiabatic approximation for modes near the gapless Goldstone mode, can significantly affect condensate populations and Tan's contact for a Bose gas that has undergone a deep quench. In particular, we find that even when the Bose gas is quenched to unitarity, $n_c(t)$ does not completely deplete, approaching, instead, to a steady state with a finite condensate fraction.

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