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Optimized sympathetic cooling of atomic mixtures via fast adiabatic strategies STEPHEN CHOI, Department of Physics, University of Massachusetts, Boston, MA 02125, ROBERTO ONOFRIO[1], Dipartimento di Fisica Galileo Galilei", Universit a di Padova, Via Marzolo 8, Padova, Italy, BALA SUNDARAM, Department of Physics, University of Massachusetts, Boston, MA 02125 — The talk will explore the extent to which frictionless cooling techniques may be useful in sympathetic cooling of Fermi gases. It is argued that optimal cooling of an atomic species may be obtained by means of sympathetic cooling with another species whose trapping frequency is dynamically changed to maintain constancy of the Lewis-Riesenfeld adiabatic invariant, which in turn determines the temporal-profile of the changing frequency. An important motivating factor is that an usually undesired feature of these techniques, i.e., the fact that the atomic cloud does not increase its phase-space density and therefore its degeneracy, turns into a crucial asset when viewed from the perspective of maintaining the gas in the nondegenerate regime, thus making it an optimal coolant. Advantages and limitations of this cooling strategy are discussed, with particular regard to the possibility of cooling Fermi gases to a deeper degenerate regime. We also show that the links between the suggested method and quantum squeezing.

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