Abstract Submitted
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The Quantum Efficiency of Adiabatic Transfer Laser Cooling[1] J.P. BARTOLOTTA, M.A. NORCIA, J.R.K. CLINE, J.K. THOMPSON, M.J. HOLLAND, Univ of Colorado - Boulder, JILA — SWAP (Sawtooth Wave Adiabatic Passage) cooling is a new laser cooling mechanism that offers significant advantages over traditional cooling techniques for particles with narrow linewidth transitions. The particles interact with counter-propagating laser beams that are repeatedly, linearly swept over the transition frequency. Compared to Doppler cooling, SWAP cooling's reduced reliance on spontaneous emission allows for larger slowing forces per scattering event, i.e., a higher quantum efficiency. Using simulation techniques such as quantum Monte Carlo wavefunction and c-number Langevin equation methods, we characterize the parameters necessary to achieve significant phase space compression with minimal scattering events. We also investigate other quantities of interest, such as minimum temperatures, conservative forces and capture range. SWAP cooling's ability to promote significant coherent transfer suggests its applicability to systems lacking closed cycling transitions, such as molecules.

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