

Abstract Submitted
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A Study of the Laser Cooling Potential of the ARP Force¹ JOHN ELGIN, JAMES DRAGAN, HAROLD METCALF, Physics, Stony Brook University, Stony Brook NY 11794-3800 — Adiabatic Rapid Passage (ARP) is used to produce optical forces much stronger than the radiative force.² It works best when $\Omega_0 \sim \delta_0 \gg \omega_m \gg \gamma$, where Ω_0 , δ_0 , ω_m , and γ are the Rabi frequency, sweep range, sweep rate, and the spontaneous emission rate respectively. However, ARP has been shown to work in the parameter range of $\Omega_0 \sim \delta_0 \sim \omega_m$. We have now found that the force is stronger when the center frequency of the laser sweep is detuned from atomic resonance by an amount that is comparable to ω_m , and this too is beyond the normal parameter range. Other observations have shown that the strength of the force is strongly dependent on the shape and characteristics of the modulated pulses. By investigating these effects we are working towards using ARP for laser cooling, by studying the force's velocity dependence in the $2^3S_1 \rightarrow 2^3P_2$ transition in He.

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²D. Stack et al., Phys. Rev. A **84** 013420 (2011)

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