

Abstract Submitted
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Toward Laser Cooling without Spontaneous Emission¹ CHRISTOPHER CORDER, BRIAN ARNOLD, HAROLD METCALF, Stony Brook University, Stony Brook, NY 11794-3800 — The bichromatic force (BF) can be used for laser cooling in the absence of closed cycling transitions because it can cool without spontaneous emission² (SE). Previous BF experiments have used transitions with long characteristic cooling times $\tau_c = \Delta p/F \sim \pi/4\omega_r$ thereby allowing many SE events. We are building an experiment using the $2^3S_1 \rightarrow 3^3P_2$ transition at $\lambda = 389$ nm in He because its large recoil frequency $\omega_r = 2\pi \times 330$ kHz makes τ_c comparable to the 3^3P_2 lifetime ~ 100 ns so that there would be minimal SE events during τ_c . We will describe our experiment as well as studies of the density matrix solutions for the force integrated over short interaction times accounting for atomic velocity changes. These solutions are used for Monte Carlo simulations of experimental conditions incorporating He beam trajectories and velocity distributions.

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²H. Metcalf, *Phys. Rev. A* **77**, 061401 (2008).

Harold Metcalf
Stony Brook University, Stony Brook, NY 11794-3800

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