Abstract Submitted
for the DAMOP06 Meeting of
The American Physical Society

Nonadiabatic Transitions in Adiabatic Rapid Passage[1] T. LU[2], X. MIAO, H. METCALF, Physics, Stony Brook University, NY 11794-3800 USA — Optical forces much larger than the ordinary radiative force can be achieved on a two-level atom by multiple repetitions of adiabatic rapid passage sweeps with counterpropagating light beams[3]. Chirped light pulses drive the atom-laser system up a ladder of dressed state energy sheets on sequential trajectories, thereby decreasing the atomic kinetic energy. Nonadiabatic transitions between the energy sheets must be avoided for this process to be effective. We have calculated the nonadiabatic transition probability for various chirped light pulses numerically. These results were compared to the first Demkov-Kunike model[4] and the well-known Landau-Zener model. In addition, an analytical form of the nonadiabatic transition probability has been found for linearly chirped pulses and an approximate form for generic symmetric finite-time pulses has been found for the entire parameter space using the technique of unitary integration. From this, the asymptotic transition probability in the adiabatic limit was derived.

[1]Supported by ONR and ARO
[2]Computational Science Center, Brookhaven Nat'l. Lab, Upton NY
[3]T. Lu, X. Miao, and H. Metcalf, Phys., Rev. **A 71** 061405(R) (2005)
[4]Yu. Demkov and M. Kunike, Vestn. Leningr. Univ. Fis. Khim., **16**, 39 (1969); K.-A. Suominen and B. Garraway, Phys. Rev. **A45**, 374 (1992)

Harold Metcalf
Stony Brook University

Date submitted: 24 Jan 2006 Electronic form version 1.4