Abstract Submitted
for the DAMOP06 Meeting of
The American Physical Society

Magic wavelengths for the $ns-np$ transitions in alkali-metal atoms
BINDIYA ARORA, M.S. SAFRONOVA, University of Delaware, CHARLES W. CLARK, National Institute of Standards and Technology, Gaithersburg — Extensive calculations of the electric-dipole matrix elements in alkali-metal atoms are conducted using the relativistic all-order method. This approach is a linearized version of the coupled-cluster method, which sums infinite sets of many-body perturbation theory terms; it is one of the most accurate methods currently being used in atomic structure calculations. All allowed transitions between four lowest $s, p_{1/2}, p_{3/2}$ states and three lowest $d_{3/2}, d_{5/2}$ states are considered and an estimate of the accuracy of the calculation is conducted. The results are used for the high-precision calculation of the frequency-dependent polarizabilities of the alkali-atoms in excited states. We find "magic" wavelengths in alkali-metal atoms for which the ns and $np_{1/2,3/2}$ atomic levels have the same ac-Stark shifts, which facilitates state-insensitive optical cooling and trapping.

Bindiya Arora
University of Delaware

Date submitted: 27 Jan 2006 Electronic form version 1.4