Abstract Submitted
for the DAMOP07 Meeting of
The American Physical Society

Ac-Stark shift of the hyperfine levels of alkali-metal atoms BINDIYA ARORA, M.S. SAFRONOVA, University of Delaware, CHARLES W. CLARK, National Institute of Standards and Technology, Gaithersburg — We study the ac-Stark shift of the hyperfine levels of the Na, K, Rb and, Cs atoms in the ns ground and np excited states. Both scalar and tensor frequency-dependent polarizabilities are calculated. The electric-dipole matrix elements used in the evaluation of the dominant contributions to the polarizabilities are calculated using the relativistic all-order method. The particular all-order method used in this work is a linearized version of the coupled-cluster method that sums infinite sets of many-body perturbation theory terms. Our static polarizability values are found to be in good agreement with other experimental and theoretical results. We also evaluate "magic" wavelengths in alkali-metal atoms for which $np_{3/2}FM$ and $nsF'M'$ hyperfine sub levels have the same ac-Stark shift enabling state-insensitive optical cooling and trapping.

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Date submitted: 05 Feb 2007 Electronic form version 1.4