Abstract Submitted
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Relativistic many-body calculation of energies, lifetimes, hyperfine constants, and polarizabilities in ^{7}Li W.R. JOHNSON, University of Notre Dame, U.I. SAFRONOVA, A. DEREVIANKO, University of Nevada, Reno, M.S. SAFRONOVA, University of Delaware — Excitation energies of ns, np, nd, and nf ($n \leq 6$) states in neutral lithium are evaluated within the framework of relativistic many-body theory. First-, second-, third-, and all-order Coulomb energies and first- and second-order Breit corrections to energies are calculated. All-order calculations of reduced matrix elements, oscillator strengths, transition rates, and lifetimes are given for levels up to $n = 4$. Electric- dipole ($2s - np$), electric-quadrupole ($2s - nd$), and electric-octupole ($2s - nf$), matrix elements are evaluated to obtain the corresponding ground state multipole polarizabilities using the sum-over-states approach. Scalar and tensor polarizabilities for the $2p_{1/2}$ and $2p_{3/2}$ states are also calculated. Magnetic dipole hyperfine constants A are determined for low-lying levels up to $n = 4$. The quadratic Stark shift for the $(F = 2\ M = 0) \leftrightarrow (F = 1\ M = 0)$ ground-state hyperfine transition is found to be -0.0582 Hz/(kV/cm)^2, in slight disagreement with the experimental value -0.061$\pm$0.002 Hz/(kV/cm)^2. Matrix elements used in evaluating polarizabilities, hyperfine constants, and the quadratic Stark shift are obtained using all-order method.

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