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Blackbody radiation shift, multipole polarizabilities, oscillator strengths, lifetimes, hyperfine constants, and excitation energies in Ca^+
U.I. SAFRONOVA, University of Nevada, Reno, M.S. SAFRONOVA, University of Delaware — A systematic study of Ca^+ atomic properties is carried out using high-precision relativistic all-order method where all single, double, and partial triple excitations of the Dirac-Fock wave functions are included to all orders of perturbation theory. Energies, $E1$, $E2$, $E3$, matrix elements, transition rates, lifetimes, A and B hyperfine constants, $E1$, $E2$, and $E3$ ground state polarizabilities, scalar $E1$ polarizabilities of the $5s$, $6s$, $7s$, $8s$, $4p$, $5p$, $3d$, $4d$ states, and tensor polarizabilities of the $4p$, $5p$, $3d$, and $4d$ states are calculated. The uncertainties are evaluated for most of the values listed in this work. The blackbody radiation shift of the $4s - 3d_{5/2}$ clock transition in Ca^+ is calculated to be 0.381 (4) Hz at room temperature, $T = 300K$ improving its accuracy by a factor of 3. The quadratic Stark effect on hyperfine structure levels of $^{43}Ca^+$ ground state is investigated. These calculations provide recommended values critically evaluated for their accuracy for a number of Ca^+ atomic properties useful for a variety of applications.

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