Abstract Submitted
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High-precision study of Hg^+ atomic properties MATT SIMMONS, M.S. SAFRONOVA, University of Delaware, U.I. SAFRONOVA, University of Nevada, Reno — The systematic study of Hg^+ 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. Third-order many-body perturbation theory calculations are also carried out to establish the size of the higher-order corrections. Excitation energies of the $[Xe]4f^{14}5d^{10}ns$, $[Xe]4f^{14}5d^{10}np$, $[Xe]4f^{14}5d^{10}nd$, $[Xe]4f^{14}5d^{10}n'f$, and $[Xe]4f^{14}5d^{10}n'g$ ($n \leq 10$, $n' \leq 9$) states in Hg^+ are evaluated. Reduced matrix elements, oscillator strengths, and transition rates are determined for electric-dipole transitions including the ns ($n = 6 - 11$), np ($n = 6 - 10$), nd ($n = 6 - 10$), nf ($n = 5 - 9$), and ng ($n = 5 - 9$) states. Lifetimes of these states, E1 ground state polarizability, and the hyperfine A and B constants of the first low-lying levels up to $n = 7$ are determined. The quadratic Stark effect on hyperfine structure levels of $^{199}Hg^+$ ground state is investigated. These calculations provide critically evaluated recommended values of Hg^+ atomic properties.

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