Abstract Submitted
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Excitation energies, hyperfine constants, E1, E2, M1 transition rates, and lifetimes of $6s^2nl$ states in Tl I and Pb II U.I. SAFRONOVA, University of Nevada, Reno, M.S. SAFRONOVA, University of Delaware, W.R. JOHNSON, University of Notre Dame — Energies of $6s^2np_j$ (n = 6–9), $6s^2ns_{1/2}$ (n = 7– 9), $6s^2nd_j$ (n = 6–8), and $6s^2nf_{5/2}$ (n = 5–6) states in Tl I and Pb II are obtained using relativistic many-body perturbation theory. Reduced matrix elements, oscillator strengths, transition rates, and lifetimes are determined for the 72 possible $6s^2nl_j - 6s^2n'l'_{j'}$ electric-dipole transitions. Electric-quadrupole and magnetic-dipole matrix elements are evaluated to obtain $6s^2np_{3/2}-6s^2mp_{1/2}$ (n, m = 6, 7) transition rates. Hyperfine constants A are evaluated for $6s^2np_j$ (n = 6–9), $6s^2ns_{1/2}$ (n = 7–9), and $6s^2nd_j$ (n = 6–8) states in ^{205}Tl. First-, second-, third-, and all-order corrections to the energies and matrix elements and first- and second-order Breit corrections to energies are calculated. In our implementation of the all-order method, single and double excitations of Dirac-Fock wave functions are included to all orders in perturbation theory. These calculations provide a theoretical benchmark for comparison with experiment and theory. Work was supported in part by National Science Foundation Grant No. PHY-01-39928 and DOE/NNSA under UNR grant DE-FC52- 01NV14050.

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