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Relativistic many-body calculation of energies, lifetimes, hyperfine constants, multipole polarizabilities, and black-body radiation shift in ^{137}Ba II ULYANA SAFRONOVA, University of Nevada, Reno — Excitation energies of the [Xe]$ns_{1/2}$ [Xe]np_j, and [Xe]nd_j ($n \leq 12$ and [Xe]=$1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 34d^{10} 5s^2 5p^6$) in Ba II are evaluated. First-, second-, third-order, and all-order Coulomb energies and first- and second-order Coulomb-Breit energies are calculated. Electric-dipole ($6s_{1/2} - np_j$, $n = 6$–26), electric-quadrupole ($6s_{1/2} - nd_j$, $n = 5$–26), and electric-octupole ($6s_{1/2} - nf_j$, $n = 4$–26) matrix elements are calculated to obtain the ground state E1, E2, and E3 static polarizabilities. Scalar polarizabilities of the $ns_{1/2}$, $np_j$and nd_j states, and tensor polarizabilities of the $np_{3/2}$ and nd_j excited states of Ba^+ are evaluated. All above-mentioned matrix elements are determined using all-order methods. We investigate the hyperfine structure in ^{137}Ba II. The hyperfine A- and B-values are determined for the first the first low-lying levels up to $n = 9$. The quadratic Stark effect on hyperfine structure levels of ^{137}Ba II ground state is investigates. The calculated shift for the ($F = 2$, $M = 0$) $\leftrightarrow$ ($F = 1$, $M = 0$) transition is -0.2931 Hz/(kV/cm)^2, in agreement with previous theoretical result -0.284(3). These calculations provide a theoretical benchmark for comparison with experiment and theory.

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