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Third-order relativistic many-body calculation of matrix elements for divalent systems DANSHA JIANG, RUPSI PAL, MARIANNA SAFRONOVA, University of Delaware — Third-order relativistic many-body perturbation theory (MBPT) formulas for the calculation of the transition matrix elements in systems with two valence electrons are derived. The two-particle contributions are identified among 162 third- order Goldstone diagrams and organized into 17 terms. The one-particle contributions are identical to the previously studied third-order terms in monovalent systems. Complete angular reductions of the third-order amplitudes are given. The model potential is taken to be the Dirac-Hartree- Fock (DHF) potential $V^{(N-2)}$ of the closed core. We use B-splines to generate a complete set of DHF basis orbitals for the numerical evaluation of the perturbation theory terms. The effect of the Breit interaction is also investigated. The preliminary results of the third-order calculations are presented for selected systems. Comparisons are made with second-order MBPT results, and with other calculations.

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