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Development of the CI + all-order method for atomic calculations MARIANNA SAFRONOVA, University of Delaware, MIKHAIL KOZLOV, Petersburg Nuclear Physics Institute, Russia, WALTER JOHNSON, University of Notre Dame — The development of the relativistic all-order method where all single and double excitations of the Dirac-Hartree-Fock wave function are included to all orders of perturbation theory led to accurate predictions for energies, transition amplitudes, hyperfine constants, and other properties of monovalent atoms. The all-order method is designed to treat core-core and core-valence correlations with high accuracy. Precision calculations for atoms with several valence electrons require an accurate treatment of the very strong valence-valence correlation; a perturbative approach leads to significant difficulties. In this work, we develop a novel method for precision calculation of properties of atomic systems with more than one valence electron. This method combines the all-order approach currently used in precision calculations of properties of monovalent atoms with the CI approach. The preliminary results for divalent systems are presented.

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