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Development of a configuration-interaction plus all-order method for atomic calculations MARIANNA SAFRONOVA, University of Delaware, M.G. KOZLOV, PNPI, Russia, DANSHA JIANG, University of Delaware — We developed a theoretical method within the framework of relativistic many-body theory to accurately treat correlation corrections in atoms with few valence electrons. This method combines the all-order approach currently used in precision calculations of properties of monovalent atoms with the configuration-interaction approach that is applicable for many-electron systems. This approach has been tested on the calculation of energy levels of divalent systems from Mg to Hg. We have demonstrated an improvement of at least a factor of 3 in agreement with experimental values for the two-electron binding energies and most excited-state energies in comparison with the CI+MBPT (many-body perturbation theory) method [1]. In the present work, we have extended CI+all-order method to the calculation of the transition properties and polarizabilities of divalent systems. Results are reported for the blackbody radiation shifts and magic wavelengths of divalent systems that are of interest to atomic clock development.

[1] M. S. Safronova, M. G. Kozlov, W. R. Johnson, and Dansha Jiang, Phys. Rev. A 80, 012516 (2009)

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