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Calculation of Blackbody Radiation Shifts for Atomic Clock Research MARIANNA SAFRONOVA, University of Delaware, M.G. KOZLOV, PNPI, Russia, DANSHA JIANG, BINDIYA ARORA, University of Delaware, CHARLES W. CLARK, JQI, NIST and University of Maryland, ULYANA SAFRONOVA, University of Nevada, Reno — A systematic study of the blackbody radiation (BBR) shifts in various systems of interest to the development of optical frequency standards is carried out. The calculations for monovalent systems, such as Ca^+ and Sr^+, are carried out using the relativistic all-order method where all single and double excitations of the Dirac-Fock wave function are included to all orders of perturbation theory. This method was demonstrated to yield accurate predictions for various atomic properties of monovalent atoms. Precision calculations for atoms with more than one valence electron require an accurate treatment of the very strong valence-valence correlation; a perturbative approach leads to significant difficulties. Our calculations of BBR shifts for divalent systems such as Sr are carried out using a new approach that combines the relativistic all-order method and the configuration-interaction method. Other atomic properties of monovalent and divalent systems of interest to atomic clock research are evaluated as well. The shift due to blackbody radiation in the hyperfine transition (F=1, M=0 – F=0, M=0) in $^{171}Yb^+$ is also evaluated and found to be in good agreement with the only existing calculation of Angstmann et al. [Phys. Rev. A **74**, 023405 (2006)].

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