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Blackbody radiation shift in optical frequency standard with $^{43}Ca^{+}$ ion BINDIYA ARORA, M.S. SAFRONOVA, University of Delaware, CHARLES W. CLARK, National Institute of Standards and Technology, Gaithersburg — The static polarizabilities of Ca^{+} ion in the $4s_{1/2}$ ground and $3d_{5/2}$ excited states are calculated to high precision. The calculations are based on the relativistic all-order single-double method where all single and double excitations of the Dirac-Hartree-Fock wave function are included to all orders of perturbation theory. The accuracy of the all-order electric-dipole matrix elements for the $4s-np_{1/2}$, $4s-np_{3/2}$, $3d_{5/2}-np_{3/2}$, $3d_{5/2}-nf_{5/2}$, and $3d_{5/2}-nf_{7/2}$ transitions needed for the polarizability calculations is investigated. Additional calculations are conducted for the dominant contributions in order to evaluate some omitted high-order corrections and evaluate the resulting uncertainties in the polarizability values. We use the the polarizability values to calculate the black body radiation shift in $4s_{1/2} - 3d_{5/2}$ transition of Ca^{+} ion at room temperature (T=300 K) and its uncertainty. The tensor polarizability of the $3d_{5/2}$ level is also calculated and its uncertainty is evaluated as well. Our results are compared with other calculations. This work is motivated by a prospect of optical frequency standard based on a $^{43}Ca^{+}$ ion.

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