Abstract Submitted
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Blackbody radiation shift in the Sr optical atomic clock[1] SERGEY PORSEV, MARIANNA SAFRONOVA, University of Delaware, UL'YANA SAFRONOVA, University of Nevada in Reno, MIKHAIL KOZLOV, PNPI and LETI, CHARLES CLARK, NIST and the University of Maryland — We evaluated the static and dynamic polarizabilities of the $5s^2\ {}^1S_0$ and $5s5p\ {}^3P_0^o$ states of Sr using the high-precision relativistic configuration interaction + all-order method. Our calculation explains the discrepancy between the recent experimental $5s^2\ {}^1S_0 - 5s5p\ {}^3P_0^o$ dc Stark shift measurement $\Delta\alpha = 247.379(7)$ [Middelmann *et. al*, Phys. Rev. Lett. **109**, 263004 (2012)] and the earlier theoretical result of 261(4) a.u. [Porsev and Derevianko, Phys. Rev. A **74**, 020502R (2006)]. Our present value of 247.5 a.u. is in excellent agreement with the experimental result. We also evaluated the dynamic correction to the BBR shift with 1% uncertainty; -0.1492(16) Hz. The dynamic correction to the BBR shift is unusually large in the case of Sr (7%) and it enters significantly into the uncertainty budget of the Sr optical lattice clock. We suggest future experiments that could further reduce the present uncertainties.

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