Abstract Submitted
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High-accuracy calculation of black-body radiation shift in ^{133}Cs primary frequency standard[1] KYLE BELOY, ULYANA SAFRONOVA, ANDREI DEREVIANKO, University of Nevada, Reno — Black-body radiation (BBR) shift is an important systematic correction for the atomic frequency standards realizing the SI unit of time. In recent years there has been a controversy over the value of the BBR shift for the primary ^{133}Cs standard. At room temperatures, reported values from various groups have differed at the 3×10^{-15} level, while modern clocks are aiming at 10^{-16} accuracies. We have carried out high-precision relativistic many-body calculations of the BBR shift. For the BBR coefficient β at $T = 300K$ we have obtained $\beta = -(1.708 \pm 0.006) \times 10^{-14}$, implying 6×10^{-17} fractional uncertainty. While in accord with the most accurate measurement, our 0.35%-accurate value is in a substantial, 10%, disagreement with recent semi-empirical calculations. We have identified an oversight in those calculations, largely resolving the controversy. These results were presented in PRL 97, 040801 (2006).

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