Abstract Submitted
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Critically evaluated theoretical energies, lifetimes, static and dynamic polarizabilities, and magic wavelengths in cesium MARIANNA SAFRONOVA, University of Delaware and JQI, U. I. SAFRONOVA, University of Nevada, Reno, CHARLES W. CLARK, Joint Quantum Institute, NIST and the University of Maryland — Systematic study of Cs atomic properties is carried out using a high-precision relativistic all-order method. Excitation energies of the ns, np, nd, and nf (n $\leq$ 12) states in neutral cesium are evaluated. Reduced matrix elements, transition rates, and lifetimes are determined for the levels up to n = 8. Recommended values and estimates of their uncertainties are provided for a large number of electric-dipole transitions. Electric-dipole ($6s - np$, n = 6-26)and electric-quadrupole ($6s - ndj$, n = 5-26) matrix elements are calculated to obtain the ground state E1 and E2 static polarizabilities. Scalar polarizabilities of the $ns, np, andnd$ states, and tensor polarizabilities of the $np_{3/2}$ and nd_j excited states of Cs are evaluated. These calculations provide recommended values critically evaluated for their accuracy for a number of Cs atomic properties useful for a variety of applications. Using first-principles calculations, we identify magic wavelengths λ for the $6s - 7p_{1/2}$ and $6s - 7p_{3/2}$ transitions in Cs. The ns and np_j atomic levels have the same ac Stark shifts at the corresponding magic wavelength, which facilitates state-insensitive optical cooling and trapping.

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