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Abstract for an Invited Paper
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Polarizabilities, Atomic Clocks, and Magic Wavelengths[1]

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I will describe the high-precision calculations of the static and frequency-dependent polarizabilities in alkali-metal atoms and Ca^+. The resulting polarizability values are used for a variety of applications from reducing the decoherence in quantum logic gates to the evaluation of the black-body radiation (BBR) shifts for optical frequency standards. Our alkali-metal atom polarizability calculations can be used to predict the oscillation frequencies of optically-trapped atoms, and particularly the ratios of frequencies of different species held in the same trap. We identify wavelengths at which two different alkali atoms have the same oscillation frequency. We also evaluate "magic" wavelengths in alkali-metal atoms for which np and ns levels have the same ac-Stark shift enabling state-insensitive optical cooling and trapping. The calculation of the BBR shift for the optical frequency standard with Ca^+ ion is also described.

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