Convergence of NCCI calculations for light p-shell nuclei with the Coulomb–Sturmian basis

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Abstract

Calculations in the *ab initio* no-core configuration interaction (NCCI) approach have conventionally been carried out using the harmonic-oscillator many-body basis. However, the rapid falloff (Gaussian asymptotics) of the oscillator functions at large radius makes them poorly suited for the description of the asymptotic properties of the nuclear wave function. We instead consider an alternative basis, built from Coulomb–Sturmian radial functions, which provide realistic (exponential) radial falloff. Applications of this basis to NCCI calculations of light p-shell nuclei will be discussed, including the convergence properties of energies, RMS radii, and other long-range observables.