# Ab initio nuclear widths, real and virtual

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Abstract

In the last two decades it has been demonstrated that light nuclei are described accurately as collections of particles interacting through the bare nucleon-nucleon potential. Accounting additionally for three-body potential terms produces good quantitative agreement between calculations and experiment concerning many nuclear properties -- in particular the energy spectra -- in nuclei up to mass-12 and beyond. The result is a predictive ab initio theory of nuclear properties that can be applied to new problems with minimal additional tuning or extrapolation difficulties. Widths of unbound nuclear levels and the asymptotic normalization coefficients (ANCs) or "virtual widths" that are their bound-state analogues have been mostly neglected in ab initio studies. These quantities can provide additional tests of the models, in many cases not yet probed by experiment, and they can be useful for the estimation of astrophysical cross sections. I will describe recent ab initio calculations of ANCs and widths using quantum Monte Carlo methods, present the results, and discuss the applicability of related techniques to future calculations of reaction and scattering cross sections.