Connection between asymptotic normalization coefficients and resonance widths of mirror states

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Asymptotic normalization coefficients (ANCs) are fundamental nuclear constants playing important role in nuclear reactions, nuclear structure and nuclear astrophysics. In this paper a connection between ANCs and resonance widths of the mirror states is established. Using Pinkston-Satchler equation the ratio for resonance widths and ANCs of mirror nuclei is obtained in terms of the Wronskians from the radial overlap functions and regular solutions of the two-body Schr¨odinger equation with the short-range interaction excluded. This ratio allows one to use microscopic overlap functions for mirror nuclei in the internal region, where they are the most accurate, to correctly predict the ratio of the resonance widths and ANCs for mirror nuclei, which determine the amplitudes of the tails of the overlap functions. If the microscopic overlap functions are not available one can express the Wronskians for the resonances and mirror bound states in terms of the corresponding mirror two-body potential-model wave functions. A further simplification of the Wronskians ratio leads to the equation for the ratio of the resonance widths and mirror ANCs, which is expressed in terms of the ratio of the two-body Coulomb scattering wave functions at the resonance energy and at the binding energy [1]. Calculations of the ratios of resonance widths and mirror ANCs for different nuclei are presented. From this ratio one can determine the resonance width if the mirror ANC is known and vice versa. Comparisons with available experimental ratios are done.

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[1] N.K. Timofeyuk, R.C. Johnson, and A.M. Mukhamedzhanov, Phys. Rev. Lett. **91**, 232501 (2003).