Coulomb renormalization and ratio of proton and neutron asymptotic normalization coefficients for mirror nuclei

A. M. Mukhamedzhanov

Asymptotic normalization coefficients (ANCs) are fundamental nuclear constants playing an important role in nuclear reactions, nuclear structure, and nuclear astrophysics. In this work the physical reasons for the Coulomb renormalization of the ANC are addressed. Using the Pinkston-Satchler equation the ratio for the proton and neutron 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 ANCs for mirror nuclei, which determine the amplitudes of the tails of the overlap functions. Calculations presented for different nuclei demonstrate the Coulomb renormalization effects and independence of the ratio of the nucleon ANCs for mirror nuclei on the channel radius. This ratio is valid both for bound states and resonances. One of the goals of this paper is to draw attention to the possibility of using the Coulomb renormalized ANCs rather than the standard ones, especially when the standard ANCs are too large.

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