

Asymptotic normalization coefficients and spectroscopic factors from deuteron stripping reactions

D.Y. Pang and A.M. Mukhamedzhanov

We present the analysis of three deuteron stripping reactions, $^{14}\text{C}(d,p)^{15}\text{C}$, $^{58}\text{Ni}(d,p)^{59}\text{Ni}$ and $^{116}\text{Sn}(d,p)^{117}\text{Sn}$ using the combined method [1], in which each reaction is analyzed at low and significantly higher energies. At low energies all these reactions are peripheral and the experimental asymptotic normalization coefficients (ANCs) are determined with accuracy about 10%. At higher energies we determine the spectroscopic factors (SFs) by fixing the normalization of the peripheral parts of the reaction amplitudes governed by the ANCs found from the low-energy data. The combined method imposes a strict limitation on the variation of the geometrical parameters of the single-particle potential, which can be arbitrarily taken in the standard approach. By checking the compatibility of the ANCs and SFs using the combined method we reveal the flaw in the contemporary nuclear reaction theory in treating the nuclear interior, which is the most crucial part in the determination of the SFs.

The work has been published in Phys. Rev. C 90, 044611 (2014).

[1] A.M. Mukhamedzhanov and F.M. Nunes, Phys. Rev. C **72**, 017602 (2005)