Analysis of Backward Proton Emission from $(p, p'x)$ Reactions at Intermediate Energies

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The semiclassical distorted wave (SCDW) model with Wigner transform of the one-body density matrix is applied to multistep direct $(p, p'x)$ reactions to the continuum [1, 2]. The model uses Wigner distribution functions obtained in methods which include nucleon-nucleon correlations to a different extent, in comparison with the case when Woods-Saxon (WS) single-particle wave functions are used. The high-momentum components of target nucleons that play a crucial role in reproducing the high-energy part of the backward proton spectra are properly taken into account. The SCDW model is tested in analyses of multistep direct processes in ^{12}C$(p, p'x)$, ^{40}Ca$(p, p'x)$ and ^{90}Zr$(p, p'x)$ reactions for the incident energy range of 150–392 MeV. The double differential cross sections are calculated up to three-step processes. The calculated angular distributions are in good agreement with the experimental data, in particular at backward angles where the previous SCDW calculations [1, 2] with the WS single-particle wave function showed large underestimation. It is found that the result with the Wigner distribution function based on the coherent density fluctuation model provides overall better agreement with the experimental data for different emission energies considered.

References

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