Effect of tensor interactions via high-momentum neutron-transfer reaction

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Tensor interactions are important nuclear interactions acting between nucleons in atomic nuclei. Theoretical studies have pointed out the importance of the tensor interactions in understanding the structure of $^{9\text{-}11}$Li [1], and predicted high-momentum components, in particular at around 2 fm^{-1} [2-4].

To understand the effect of tensor interactions on nuclear structure, we measured the cross-section of (p,d) reaction on the “doubly-closed-shell” nucleus, ^{16}O, at the GSI Helmholtzzentrum für Schwerionenforschung GmbH. We performed 0-degree measurements and compared with previous work [5], in which the deuterons were detected at finite scattering angles between 10 and 25 degrees. To cover the transfer momentum around 2 fm^{-1}, we used proton beam at energies varying at 403, 604, 907 and 1209 MeV. Missing-mass spectra of the residual ^{15}O nucleus were reconstructed from the momenta of deuterons that were measured by the projectile fragment separator (FRS) as a spectrometer. We used a POM (Mylar) foil as the Oxygen target and ^{nat}C target to subtract the contributions of the ^{12}C contaminant in POM. We also have measured the proton elastic scattering with CD_2 target and compared with Monte Carlo simulations to understand the optics and to determine the transmission efficiency of the FRS. The results are consistent with the previous work [5] and hence show that the effect of reaction mechanisms is negligible. The results provide evidence of the enhanced high-momentum neutrons due to tensor interactions. In this talk, we will give experimental details and present the results.

References

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