



Contribution ID: 43

Type: Talk

Application of the JISP16 potential to the nucleon induced deuteron breakup process at $E=13$ MeV and $E=65$ MeV.

Thursday 5 September 2019 15:20 (20 minutes)

The JISP16 nucleon-nucleon force [1] arise from the Inverse Scattering Methods and was proposed as an alternative to the standard models of two-nucleon interactions. It provides a sufficient convergence of the no-core shell model [2] calculations enabling accurate predictions for nuclear binding energies and spectra of excited nuclear states with established extrapolation techniques [3–5] and the ability to perform calculations of nuclear matter properties [6]. The description of the properties of light nuclei by JISP16 is also quite satisfactory [7,8]. However, the recent application of the JISP16 force to the nucleon-deuteron elastic scattering [9] revealed some drawbacks of this force, especially regarding P-waves components of the JISP16 potential. It occurs that the bound and excited states energies, used to fix free parameters of the JISP16 model are not enough sensitive to the P-waves contributions. In order to improve the JISP16 model additional fitting, preferably taking into account nucleon-deuteron scattering observables, should be performed. In this contribution we check if the nucleon induced deuteron breakup reaction can be useful in this context.

We applied the JISP16 potential [1] to investigate the nucleon induced deuteron breakup reaction at energies $E=13$ and 65 MeV. The formalism of Faddeev equation [10] was used. Our study reveals that the JISP16 interaction delivers, in general, qualitatively a similar description of the exclusive cross section and the nucleon analyzing power for the studied reaction to the one based on the standard realistic nucleon-nucleon AV18 interaction [11]. However, in some regions of the phase space the differential cross section based on the JISP16 and on the AV18 forces differs by more than 100% and 50% at $E=13$ and $E=65$ MeV, respectively. In the case of analyzing power –this difference also exceeds 100% at $E=65$ MeV. Such specific parts of the phase space can be used to fine-tune the JISP16 potential parameters.

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Session Classification: Parallel Session Thursday: Few-Nucleon Systems

Track Classification: Nuclei