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Systematic study of the nucleon induced deuteron breakup at E=13 MeV with the JISP16 potential

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Collaboration

Abstract content

In the recent paper [1] we have revealed the shortcomings of the JISP16 nucleon-nucleon interaction [2] leading to a poor description of the nucleon-deuteron elastic scattering observables at low energies. It can be traced back to the off-the-energy-shell parts of the P-wave components of this interaction, which responsible for observed discrepancies between data and theoretical predictions. This in turn shows that the observables used during the fixing of free parameters of the JISP16 force (i.e. the energies of ground and selected excited states of some nuclei with A$\leq$16) are not sensitive enough to details of the nuclear interaction in specific partial waves.

In order to improve the JISP16 model it is necessary to refit the JISP16 force parameters. It seems reasonable to use for this purpose the nucleon-deuteron elastic scattering and/or the nucleon induced deuteron breakup data, inasmuch the exact theoretical predictions for these processes are available. In this contribution we explore a possibility of using the nucleon induced deuteron breakup differential cross section to constrain values of the JISP16 parameters. To that end we calculate, by solving the Faddeev equation [3], the differential cross section for complete kinematical configurations defined uniquely by five independent variables describing the final state kinematics. We perform such calculations, at initial nucleon laboratory energy E=13 MeV, twice: using the JISP16 force or using the standard semi-phenomenological AV18 nucleon-nucleon potential [4]. It has been already shown that the latter force delivers a good description of deuteron breakup data [3,5]. We search over the whole phase space for the kinematical configurations for which the differences between the JISP16 predictions and the AV18 ones are big, and thus could be used for improving the JISP16 force. In a proposed poster presentation we will report the obtained results, compare them with the existing data, and discuss a usefulness of the deuteron breakup process for fixing free parameters of the JISP16 potential.

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