Modern two-nucleon forces in three-nucleon reactions

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In recent years the family of nucleon-nucleon interactions has been expanded by new models arising from different assumptions and motivations.

The chiral nucleon-nucleon interaction with the semi-local regularization [1,2] is one of such models. It was derived in the framework of the Effective Field Theory up to the fifth order of the chiral expansion (N4LO). In comparison to the older version of the chiral force [3] the regularization of the potential is now performed in coordinate space what leads to a much better control of finite-cutoff artefacts. The complex operator structure of the three-nucleon force, which starts to contribute at the next-to-next-to leading order (N2LO), makes using the chiral interaction in practical calculations very demanding. However, the possibility to derive the electromagnetic and weak currents consistently with nuclear interactions is a strong argument in favour of chiral models. I will shortly report on a current status of applications of the chiral model [1,2] to strong and electroweak three-nucleon processes [4-5].

The JISP16 potential is another force developed recently [6] and used already with a great success in the description of ground and resonant nuclear states as well as nuclear matter [7]. This force is especially designed to be used without three-nucleon force and to accelerate the convergence of nuclear structure calculations. I will present results based on the JISP16 force for the cross sections and various spin observables in elastic neutron-deuteron scattering.

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