

Three-nucleon reactions with chiral forces

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Comparison of theoretical predictions based on a nucleon-nucleon potential with data for elastic nucleon-deuteron scattering and nucleon induced deuteron breakup reveals the importance of the three-nucleon force (3NF). Inclusion of semi-phenomenological 3NF models into calculations in many cases improves the data description. However, some serious discrepancies remain even when 3NF is included. At energies above ~ 100 MeV current 3NF's only partially improve the description of data for cross section and spin observables in elastic Nd scattering and breakup. The complex angular and energy behavior of analyzing powers, spin correlation and spin transfer coefficients fails to be explained by standard nucleon-nucleon interactions alone or combined with current models of 3NF's. One of the reasons for the above disagreements could be a lack of consistency between 2N and 3N phenomenological potentials used or/and omission of important terms in the applied 3NF. The Chiral Effective Field Theory approach provides consistent two- and three-nucleon forces. First results obtained with chiral forces up to N³LO order of chiral expansion for elastic Nd scattering and breakup will be presented together with examples of gamma reactions with 3N bound states.

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