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Spectral method for studying nuclear four-body reactions

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<p>Reactions involving four particles, either in the entrance or final channel, are quite involved when computing observables in comparison to three-body reactions. Yet these reactions are of interest in studying reactions of astrophysical interest, such as hep process, which is essential for describing the quantitative solar model.

At lower solar energies, it is difficult to measure the cross-section for the hep reaction. Moreover, there are discrepancies in calculations of the S-factor using different models and compared to the value predicted by the Standard Solar model. This problem in turn implies problems in estimating the correct value for the reaction cross-section which is crucial for the understanding of the Standard Solar model. In order to address this discrepancy and other observables, a reliable numerical technique is necessary. In this work we propose a new spectral method capable of calculating low-energy phase shifts for scattering of the nucleon off a light nucleus. We consider reactions of the type (3+1) –> (3+1), within the Faddeev-Yakubovsky framework. We show that these equations can be transformed into spectral-type set of equations that are numerical less expensive to solve in comparison to competing methods.

Level (Hons, MSc,
   PhD, other)?

PhD

Consider for a student
   award (Yes / No)?

Yes

Would you like to
 submit a short paper
 for the Conference
 Proceedings (Yes / No)?

Yes

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