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Three-dimensional configuration space Faddeev equations: Theory and Applications

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One of the common approaches toward solving the Faddeev and Faddeev-Yakubovsky equations is the use of partial-wave expansion of the solution sought, resulting in the reduction of the Faddeev equations to a set of two-dimensional coupled equations, which are amenable to numerical solution. For systems interacting via a force strong repulsive core lots of partial waves are necessary to achieve convergence. However, with the inclusion of lots of partial waves the result is an intractable numerical problem, that may only be solved with the use of high-performance computing facilities. The total-angular momentum approach proposed in [1] provides an efficient alternative to solving the Faddeev equations. In this work we use the total-angular momentum approach to solve configuration space Faddeev equations. In applications, we consider realistic nonrelativistic nuclear systems, weakly bound systems and large systems such as the 16O8. The results obtained are in good agreement with the experimental values (where they exist) and the literature ones. An attempt to present the three-dimensional version for Faddeev-Yakubovsky equations is given.

[1]. V. V. Kostrykin, A. A. Kvitsinsky, and S. P. Merkuriev. Faddeev approach to the three-body problem in total-angular-momentum representation. Few Body System, 6:97–113, 1989.

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