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Theoretical Study of Weakly-Bound Triatomic Systems with Discrete Variable Representation method

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The interest to weakly-bound triatomic systems is stimulated by their connection with Efimov physics. There is a variety of systems including helium and helium-alkali triatomic molecules [1] whose states are close to Efimov regime. Some of these systems have bound states with nonzero orbital momentum. These latter states are much less studied than the states with the zero angular momentum.
Another interesting problem is connected with possible resonance states of systems under discussion. Study of resonance states is an interesting area of few-body quantum physics [2]. Resonance states are usually associated with the poles of the analytic continuation of the resolvent or S-matrix. There exist various methods of their calculations. In this work, the complex rotation method [3] is used.
Both above mentioned problems result in additional computational complexity, so a computationally effective approach is required. To speed up calculations, we use the discrete variables representation [4] based on the basis of functions, which are in some way localized on the grid in the angular space. The method has been generalized to complex functions to make it applicable to calculation of resonance states.
In this report, the bound and resonance energies of few weakly-bound triatomic systems including He_2Li and He_2Na have been calculated with the variational approach and the DVR expansion. The results are compared with results of other authors.
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