CRCVM + ABC calculation for the three-body continuum

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The absorbing boundary condition (ABC) method, which introduces the imaginary potential outside of a total system, is one of powerful methods to handle the continuum and resonant states in few-body systems [1, 2]. In the previous studies, there are several applications of ABC to the three-body problems, but no coordinate rearrangements are taken into account [1]. The inclusion of the rearrangement channels, which means the rearrangement of the Jacobi coordinate among the three particles, is called the coupled rearrangement channels variational method (CRCVM) [3]. The CRCVM is essential to obtain the rapid convergence of the total binding energy in a three-body system [3].

In the present study, we apply the ABC method to the three-body problem, which takes into account the rearrangement channels completely. We handle the identical three-boson system, which interacts by a simple Gaussian potential [1], and the S wave configurations are considered for the relative motion among the three bosons. The rearrangement channel is explicitly considered by imposing the boson symmetry among the identical three-bosons. The absorbing potential is placed among the pair of two bosons. As for the functional form of the absorber, the polynomial function is employed [1,2].

The eigenvalues obtained by the ABC method are distributed in the complex energy plane, and the resonant states are clearly separated from the continuum spectra. We have also calculated the strength function of the isoscalar monopole operator, which leads to the three-body isotropic breakup. The strength function is calculated by applying the extended completeness relation of the ABC solutions [2]. In the present report, we will demonstrate that the ABC method nicely works in the three-body calculation with the complete rearrangement channels.

Furthermore, we are now developing the ABC method in the full microscopic cluster model, generator coordinate method (GCM) [4]. The application of ABC to the two-body GCM calculation has already been successful [5] but the formulation of ABC + GCM in the three-body system still remains unclear. In the present report, we will discuss the formulation of ABC in the three-body GCM calculation.

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