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Two particles in a spherical box with effective field theory[1] FENG WU, University of Arizona, UBIRAJARA VAN KOLCK, University of Arizona and CNRS — We study the problem of two particles interacting via short-range interactions within a spherical box in the framework of effective field theory. The three-dimensional delta potential and its derivatives are used to simulate the effects of the short-range interactions at different orders. We solve the problem in a truncated model space restricted by an ultraviolet regulator. Renormalization methods are used to obtain regulator independent observables. The leading-order (LO) interaction is iterated to all orders, whereas higher-order contributions are treated in perturbation theory. By considering systems with different scattering lengths and effective ranges, it is shown explicitly that going to next-to-LO systematically improves convergence as the model space increases. In the large-box limit, we recover the known result that the level shifts produced by the potential are proportional to the corresponding scattering phase shifts at the unperturbed energy. Our approach provides a basis for further study of many-body systems in restricted model spaces that respect spherical symmetry.

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