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# Improved Actions for Nuclear Effective Field Theories

## Content

Renormalizable nuclear effective field theories have been successful in describing nuclei up to the alpha particle but faced significant challenges for larger nuclei due to leading-order instabilities. These issues can be addressed with the introduction of a fake interaction range at leading order, whose effects are compensated for *in perturbation theory* at higher orders. The calculation of two-body phase shifts and ground-state energies of up to five $^4$He atoms in a theory with only contact interactions shows that, as long as it remains smaller or comparable to the experimental effective range, the fake range does not alter the convergence of the EFT expansion but is often beneficial at the lowest orders. I discuss the implications of this improved-action approach to the ground-state energies of $^6$Li, $^{12}$C, and $^{16}$O.

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