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Next-to-next-to-leading order Δ-full and Δ-less chiral effective field theory in harmonic oscillator basis AAINA BANSAL, RAGNER STROBERG, Department of Physics, University of Washington, Seattle WA, USA — We regulate chiral effective field theory (EFT) potentials up to next-to-next-to-leading order (NNLO), with and without intermediate Δ-excitations, directly using momentum space discrete variable representation for finite harmonic oscillator basis. We extend the method, previously developed for pionless effective field theory, to include additional pion-exchange terms between two nucleons (NN) and three-nucleons ($3N$) in chiral EFT. The key benefit of this approach is the ensured ultraviolet (UV) convergence without the need of starting from a large enough model space to capture the tail of conventionally employed momentum space regulators. We tailor the potentials to three different model spaces, $N = 6, 8$ and 10, with oscillator spacing tuned to obtain 450 MeV and 500 MeV UV cutoffs for each model space. The low-energy coefficients of the NN and $3N$ EFT interactions are adjusted to reproduce the low-energy NN phase shifts and the triton binding energy, respectively. We compute the ground state energies of nuclei with mass number $A = 2, 3$ and 4, as proof of principle calculations for this framework. Further, we compute the ground state of ^{16}O and ^{40}Ca nuclei and study their infrared convergence with increasing many-body model space.

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