

Onset of Eta-meson binding in the He isotopes

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The onset of Eta(548) binding in nuclei is explored in stochastic variational method (SVM) few-body calculations within a pionless effective field theory (EFT) approach at leading order, using regulated NN and NNN contact terms and a regulated energy-dependent Eta-N contact term derived from coupled-channel models of the $N^*(1535)$ nucleon resonance. A self consistency procedure is applied to deal with the energy dependence of the Eta-N subthreshold input, resulting in a weak dependence of the calculated Eta-nuclear binding energies on the EFT regulator. It is found [1] that the onset of binding Eta-3He requires a minimal value of the real part of the Eta-N scattering length close to 1 fm, yielding then a few MeV Eta binding in Eta-4He. The onset of binding Eta-4He requires a lower value which, however, exceeds 0.7 fm. Similar conclusions hold when the nuclear core dynamics is generated by using semi-realistic NN interactions [2].

[1] N. Barnea, B. Bazak, E. Friedman, A. Gal, arXiv:1703.02861.

[2] N. Barnea, B. Bazak, E. Friedman, A. Gal, in preparation.

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