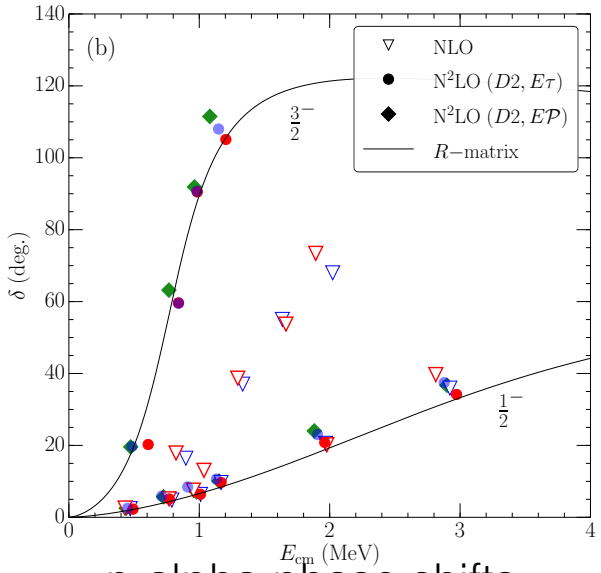
QMC and chiral 2N & 3N interactions: A=3,4,5 and neutron matter

Objectives

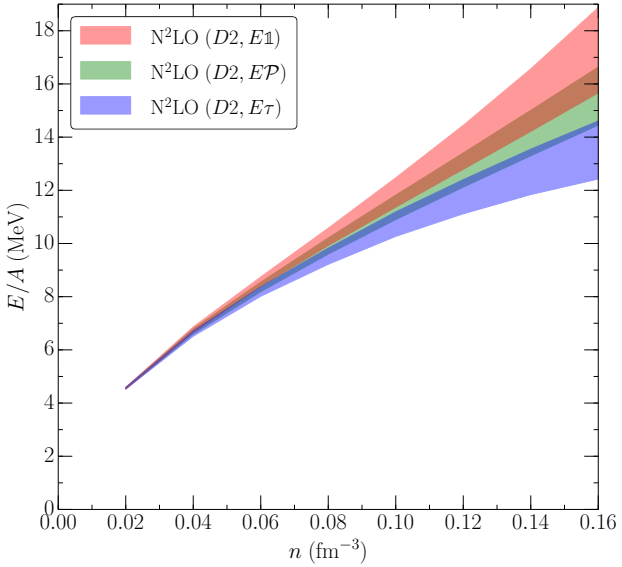
- Nuclear Quantum Monte Carlo calculations have became possible with the development of local chiral interactions at the next-to-next-to-leading order (N2LO).
- The free parameters entering in the three-body interaction have been fit to reproduce the binding energy of 4He and neutron-4He scattering.
- Identify and discuss the limits and predictive power of chiral EFT interactions.

Impact

- The effect of using "equivalent" forms for the operators and regulators entering in the chiral interactions has now been addressed and found to be important.
- Chiral interactions can provide a simultaneous description of light nuclei, neutron-alpha scattering and neutron matter.



n-alpha phase shifts
for different orders, operators



neutron matter equations-of-state
for the same interactions

Accomplishments

- We have demonstrated that light nuclei and neutron matter can be simultaneously described by chiral Hamiltonians.
- We have found that choices of regulators and operators can impact relation between n-alpha scattering and neutron matter EOS

U.S. DEPARTMENT OF ENERGY | Office of Science

NUCLEI Nuclear Computational Low-Energy Initiative

References: J.E. Lynn, et al., Phys. Rev. Lett., 116, 062501 (2016)

Contact: stefano@lanl.gov