

Joint seminar of the NPI of the CAS

Ing. Martin Schäfer, Ph.D.,
Department of Theoretical Physics, NPI of the CAS:

Scattering of few nucleons in NLO Pionless Effective Field Theory - n-d, n-³H, n-³He, and n-⁴He elastic scattering

Pionless effective field theory (EFT) represents a highly convenient tool which allows us to describe nucleon interactions at low energies using a minimal set of input parameters. Pionless EFT at leading order has been used to study various systems up to ¹⁶O, however, only with little success, rendering $A > 4$ nuclei unbound. So far, higher orders of the theory have been tested only in $A \leq 3$ nuclear systems, predominantly, due to nontrivial requirement of their perturbative inclusion. At three-body level, it has been shown that considering sub-leading terms systematically improves predictive power of the theory. Experimentally observed binding of $A > 4$ nuclei thus might be restored at higher orders.

In our work, we applied few-body approach based on the Stochastic Variational Method with a correlated Gaussian basis and a harmonic oscillator trap, which enabled us to study systems with $A > 3$. In this framework, we performed fully perturbative calculations within next-to-leading order (NLO) pionless EFT where perturbative calculations of $A=4, 5$ systems were performed for the first time. Our microscopic predictions of low-momentum n-d, n-³H, n-³He, and n-⁴He elastic scattering (scattering length and effective range) were compared to available experimental data and results of other theoretical predictions.

The seminar will take place on Thursday, March 23, 2023 at 10:00 a.m. in the NPI meeting room (conference room).