Gemeinsame Veranstaltung von
Humboldt-Universität zu Berlin, Institut für Physik
(Theorie der Elementarteilchen / Computerorientierte Theoretische Physik)
DESY, Zeuthen

SEMINAR
Feldtheorie auf dem Gitter und Phänomenologie der Elementarteilchen

Am Montag, dem **23. Juni, um 15:30 Uhr s.t.** spricht

Dr. **Hermann Krebs**

Universität Bonn

zum Thema

Nuclear effective field theory on the lattice

Abstract

Quantum chromodynamics (QCD) describes the interaction between quarks and gluons which is responsible for the strong nuclear force. Recent advances in QCD using computational lattice methods have made it possible to accurately predict the spectrum and properties of many isolated hadrons. Unfortunately, lattice QCD calculations of many-body systems of nuclear and neutron matter or even few-body systems beyond two nucleons are presently not possible. The most significant challenge in such simulations would be to overcome the exponentially small signal-to-noise ratio caused by sign and complex phase oscillations for simulations at large quark number.
Nuclear lattice simulations based on effective field theory provide an alternative method to describe few- and many-body systems at low energy without losing connection to QCD. The lattice effective field theory approach addresses the few- and many-body problem in nuclear physics by applying non-perturbative lattice methods to low-energy nucleons and pions. The effective Lagrangian is formulated on a spacetime lattice and the path integral is evaluated by Monte Carlo sampling. Pions and nucleons are treated as point-like particles on the lattice sites. By using hadronic degrees of freedom and concentrating on low-energy physics, it is possible to probe large volumes and greater number of nucleons than in lattice QCD. In my talk I will present our recent studies of the two nucleon system and neutron matter at subleading order. Accurate description of two-nucleon phase-shifts and ground state energy ratio of dilute neutron matter up to corrections of higher orders show that lattice effective field theory is a promising tool for quantitative studies of low-energy few- and many-body systems.

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