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Recent developments in nuclear lattice effective field theory

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In recent years, the lattice effective field theory, a lattice stochastic methods, were successfully applied in solving the nuclear many-body problems. It has shown great advantages in simulating from first principles the atomic nuclei at ground state and excited states, nuclear scattering and reaction, nuclear matter at zero and finite temperature, etc. In this talk, I will give a brief introduction to the method and an overview on recent important progress. Specifically, I will focus on two major breakthrough in this field. One is the investigation of the hidden spin-isospin exchange symmetry of the nuclear force, which also inspires us to develop new algorithms for implementing the chiral nuclear force as a perturbative expansion around a central force. Another topic will be the new pinhole-trace algorithm for simulating the nuclear thermodynamics, which can be as large as one thousand times faster than conventional algorithms based on grand-canonical ensemble.

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