Universität Bielefeld Fakultät für Physik

Seminar

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Fermion bag inspired Hamiltonian lattice field theory

Motivated by the fermion bag approach, we construct a new class of Hamiltonian lattice field theories that can help us to study fermionic quantum critical points, particularly those with four-fermion interactions. Although these theories are constructed in discrete time with a finite temporal lattice spacing ϵ, when ϵ goes to zero, conventional continuous-time Hamiltonian lattice field theories are recovered. The fermion bag algorithms run relatively faster when $\epsilon = 1$ as compared to ϵ going to zero, but still allow us to compute universal quantities near the quantum critical point even at such a large value of ϵ. As an example of this new approach, here we study the $N_f = 1$ Gross-Neveu chiral Ising universality class in $2 + 1$ dimensions by calculating the critical scaling of the staggered mass order parameter. We show that we are able to study lattice sizes up to 100^2 sites when $\epsilon = 1$. while with comparable resources we can only reach lattice sizes of up to 64^2 when ϵ goes to zero. The critical exponents obtained in both these studies match within errors.

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Ort: virtual space