

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 **16. Juni**, um **15:30 Uhr s.t.** spricht

Prof. Uwe-Jens Wiese

Universität Bern

zum Thema

Cluster Algorithms for Quantum Spin Systems

Abstract

Quantum spin systems such as the ferro- or antiferromagnetic spin $1/2$ Heisenberg model are strongly correlated condensed matter systems, which are characterized by constraints in their configuration spaces. The loop-cluster algorithm respects the constraints and leads to very efficient simulations of the low-energy physics of quantum magnets. Relativistic $CP(N-1)$ field theories emerge dynamically from $SU(N)$ invariant quantum spin systems via dimensional reduction. Using this unconventional regularization, nontrivial theta-vacua can be simulated without encountering a sign problem. On the other hand, simulations of geometrically frustrated quantum antiferromagnets, for example, on a triangular or Kagome lattice, suffer from a very severe sign problem. By using a nested loop-cluster algorithm, the sign problem can be eliminated for large volumes at least at moderate temperatures.

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