T 24: Gittereichtheorie II

Convenor: Gunnar Bali

Zeit: Dienstag 16:45–18:15 Raum: 30.23: 10-1

T 24.1 Di 16:45 30.23: 10-1

Lattice Determination of the Anomalous Magnetic Moment of the Muon — •Benjamin Jäger — Helmholtz-Institut, Mainz, Germany

Currently the anomalous magnetic moment of the muon shows a discrepancy of 3.2 standard deviations, which could indicate physics beyond the Standard Model. Strong interaction, especially the hadronic vacuum polarisation, dominates the theoretical uncertainty. Lattice simulations provide an approach to calculate the hadronic vacuum polarisation from first principles. We use non-perturbatively O(a) improved Wilson fermions with two degenerate, dynamical quarks. In addition partially twisted boundary condition are applied to achieve a better momentum resolution. We present the status of those calculations including the study of volume effects, continuum extrapolation and chiral extrapolation to the physical point.

T 24.2 Di 17:00 30.23: 10-1

$K->\pi\pi$ and the $\Delta I = 1/2$ rule on GPUs — •Bjoern Walk — Institut für Kernphysik, Universität Mainz

Investigations on the non-leptonic decay $K \to \pi\pi$ and the so-called $\Delta I = 1/2$ rule, which describes the enhancement of the isospin $I = 0$ channel over the isospin $I = 2$ channel require quite a substantial amount of care on the lattice. Ginsparg-Wilson fermions greatly facilitate such investigations but because they are an order of magnitude more expensive in terms of computing power special algorithms and techniques will be required.

In my talk I will report on the ongoing study on our GPU implementation of the Neuberger-Dirac operator including the calculation of zero-modes. I will give an introduction to the theoretical background and discuss performance.

T 24.3 Di 17:15 30.23: 10-1

Autocorrelations in Hybrid Monte Carlo Simulations — •Francesco Virotta — NIC,DESY, Platanenallee 6, 15738 Zeuthen

Simulations of QCD suffer from severe critical slowing down towards the continuum limit. This problem is known to be prominent in the topological charge, however, all observables are affected to various degree by these slow modes in the Monte Carlo evolution. We investigate the slowing down in high statistics simulations and propose a new error analysis method, which gives a realistic estimate of the contribution of the slow modes to the errors.

T 24.4 Di 17:30 30.23: 10-1

Stochastische Schätzung der Fermionendeterminante in MC-Simulationen — •Jacob Finkenrath, Björn Leder und Francesco Knechtli — Bergische Universität Wuppertal, Wuppertal, Deutschland

Die Herausforderung bei Monte Carlo (MC) Simulation von QCD mit dynamischen Fermionen besteht in der Behandlung der Determinante des Dirac-Operators. Der Hybrid Monte Carlo (HMC) Algorithmus reduziert den Rechenaufwand durch die Einführung eines Pseudofermionenintegrals und damit auf das Lösen linearer Gleichungssysteme. Dabei wird das Update der Eichlinks direkt mit der Gewichtung durch den fermionischen Anteil der Wirkung verbunden. Da die Autokorrelationszeiten mit kleiner werdendem Gitterabstand stark anwachsen, verliert der HMC an Effizienz.

Um möglichst große und billige Schritte im Konfigurationsraum der Eichfelder zu erreichen, schlagen wir eine Trennung in ein reines Eich-Update mit anschließendem Akzeptanzschritt für den fermionischen Anteil vor. Die fermionische Gewichtung besteht aus dem Verhältnis zweier Fermionendeterminanten. Das Herz und die Schwierigkeit des Algorithmus stellt die partielle stochastische Schätzung dieses Verhältnisses dar.

Im Vortrag werden die Ideen und Techniken des Algorithmus, wie relative Eichfixierung, Gebietszerlegung, Parametrisierung von Eichfeldern und erhöhte Akzeptanzrate, dargestellt.

T 24.5 Di 17:45 30.23: 10-1

Automated Lattice Perturbation Theory in the Schrödinger Functional Scheme — •Dirk Hesse[1], Rainer Sommer[1], and Georg M. von Hippel[2] — [1]NIC, DESY Zeuthen — [2]Universität Mainz

While there are strong ongoing efforts to obtain QCD observables completely non-perturbatively using lattice methods, one often wishes to complement these with results from lattice perturbation theory. The latter are needed as cross-checks or guidelines for non-perturbative investigations or, in some cases, as an alternative if non-perturbative methods are not known or too involved to be practical.

Since each of the multitude of lattice actions currently in use yields different Feynman rules, lattice perturbation theory calculations have in principle to be repeated if one considers a different choice of action. Furthermore, the derivation of Feynman rules is relatively error-prone, so that a high degree of automation is desired. The use of the Schrödinger Functional scheme adds further complexity due to the non-trivial boundary conditions and a non-vanishing background gauge field.

We present a software package for fully automated lattice perturbation theory in the Schröodinger functional scheme, which incorporates diagram generation and the derivation of Feynman rules for any given gauge and fermion action.

T 24.6 Di 18:00 30.23: 10-1

on su(3) lattice gluon and ghost propagators in qcd at finite temperature. — •rafik aouane[1], ernst-michael Ilgenfritz[2], andre sternbeck[3], and michael müller-preussker[4] — [1]humboldt-universität zu berlin, newtonstr 15, 12489 berlin, deutschland. — [2]humboldt-universität zu berlin, newtonstr 15, 12489 derlin, deutschland. — [3]institüt für theoretische physik universität regensburg d-93040 regensburg, deutschland. — [4]humboldt-universität zu berlin, newtonstr 15, 12489 berlin, deutschland.

We study the behaviour of the Landau gauge gluon and ghost propagator in lattice QCD at finite temperature. We compare pure gauge theory with results obtained for full QCD with Nf=2 fermion degrees of freedom in the Wilson twisted mass formulation. Systematic effects as lattice artifacts and finite size effects are studied thoroughly in order to provide results in the continuum and in the thermodynamic limit.