T 23: Gittereichtheorie I

Convenor: Gunnar Bali

Zeit: Montag 16:45–19:00 Raum: 30.23: 10-1

T 23.1 Mo 16:45 30.23: 10-1

Formulae for Topological Charge in Noncommutative U(1) Theory in Four Dimensions — Arifa Ali Khan[1], Ahmed Al-Haydari[1], Galal Saad Hassan[1], and •Harald Markum[2] — [1]University of Taiz, Yemen — [2]Vienna University of Technology

We discuss U(1) gauge theory with noncommutative space-time coordinates in two and four dimensions on a lattice with N sites. The mapping to a U(N) plaquette model in the sense of Eguchi and Kawai makes both analytical calculations and computer simulations feasible. The topological charge q can be transcribed to the plaquette and hypercube formulation in the matrix theory in 4D. There exist formulations of the classical equation of motion within the matrix model. From them we try to derive general formulae for q in four dimensions. The aim is to analyze an action-charge diagram as in 2D.

T 23.2 Mo 17:00 30.23: 10-1

Simulation of dyon ensembles in SU(2) Yang-Mills theory — •Benjamin Maier[1], Falk Bruckmann[2], Simon Dinter[1], Ernst-Michael Ilgenfritz[1,3], Michael Müller-Preussker[1], and Marc Wagner[1] — [1]Institut für Physik, Humboldt-Universität zu Berlin, Newtonstraße 15, D-12489 Berlin, Germany — [2]Institut für Theoretische Physik, Universität Regensburg, D-93040 Regensburg, Germany — [3]Fakultät für Physik, Universität Bielefeld, D-33501 Bielefeld, Germany

We study a model of dyons for SU(2) Yang-Mills theory, in particular its ability to generate a confining force between a static quark antiquark pair.

The interaction between dyons corresponds to a long range potential, which in a naive treatment with a finite number of dyons gives rise to severe finite volume effects.

To avoid such effects we apply the so-called Ewald method, which has its origin in plasma physics.

The basic idea of Ewald's method is to consider a finite number of dyons inside a finite cubic volume and enforce periodicity of this volume.

In this talk we apply Ewalds method to the logarithmic dyon potential, which is then used to simulate an ensemble of dyons by means of Monte Carlo methods.

We also present preliminary results regarding the static quark antiquark potential within this model.

T 23.3 Mo 17:15 30.23: 10-1

Confinement from exceptional gauge groups — •Björn H. Wellegehausen and Andreas Wipf — Theor. phys. Inst., FSU Jena

In $SU(3)$ gluodynamics confinement is related to the Z_3 center symmetry but it has been convincingly demonstrated that also Yang-Mills theories with gauge groups with a trivial center show confinement. To investigate such theories on the lattice we present an efficient local hybrid Monte-Carlo algorithm for exceptional gauge groups, especially G_2 gauge theory coupled to a Higgs field. In four dimensions we explored the phase diagram showing that a line of first order confinement-deconfinement phase transitions connects G_2 and $SU(3)$ gluodynamics and a line of second order phase transitions separates the two deconfinement phases. We also present first lattice results on the confinement-deconfinement phase transition in F_4 and E_6 gauge theorie.

T 23.4 Mo 17:30 30.23: 10-1

Dynamical staggered fermions in a constant magnetic background field at finite temperature — •Martin Kalinowski, Ernst-Michael Ilgenfritz, and Michael Müller-Preussker — Humboldt Universität zu Berlin

We are studying two color QCD with dynamical staggered fermions in a uniform magnetic background field at temperatures around the confinement/deconfinement transition. We provide results for the Polyakov loop and the chiral condensate as well as their susceptibilities and argue how the magnetic field shifts the transition temperature. Moreover, we report on the violation of spatial isotropy in terms of the plaquette variables.

T 23.5 Mo 17:45 30.23: 10-1

String Breaking in Lattice QCD with Wilson Twisted Mass Fermions — •Attila Nagy and Marc Wagner — Institut für Physik, Humboldt-Universität zu Berlin, Newtonstr. 15, 12489 Berlin, Germany

We investigate the transition of a static quark-antiquark pair into a static-light meson-antimeson pair when increasing the quark separation numerically by means of Wilson twisted mass lattice QCD with two dynamical quark flavours. To this end a detailed analysis of the symmetries of the problem is carried out, both in QCD and in Wilson twisted mass lattice QCD, and suitable trial states are constructed accordingly.

We show preliminary results, which indicate that string breaking takes place at a quark separation of about 1.1 fm.

T 23.6 Mo 18:00 30.23: 10-1

Nucleon Matrix Elements with $N_f = 2 + 1 + 1$ Maximally Twisted Fermions — •Simon Dinter[1], Constantia Alexandrou[2,3], Martha Constatinou[2], Vincent Drach[1], Karl Jansen[1], and Dru Renner[4] — [1]NIC, DESY, Platanenallee 6, 15738 Zeuthen — [2]Department of Physics, University of Cyprus, P.O. Box 20537, 1678 Nicosia, Cyprus — [3]Computation-based Science and Technology Research Center, The Cyprus Institute, 15 Kypranoros Str., 1645 Nicosia, Cyprus — [4]Jefferson Lab, 12000 Jefferson Avenue, Newport News, VA 23606, USA

We present a lattice calculation of nucleon matrix elements using four dynamical flavors using the $N_f = 2 + 1 + 1$ maximally twisted mass formulation. The renormalization is performed non-perturbatively in the RI′-MOM scheme.

We give results for the vector and axial vector operators with up to one-derivative and put particular emphasis on systematic effects in the calculation of the matrix elements.

T 23.7 Mo 18:15 30.23: 10-1

Finite volume corrections to the electromagnetic current — •Ludwig Greil, Thomas R. Hemmert, and Andreas Schäfer — Institut für Theoretische Physik, Universität Regensburg

We have calculated the leading one-loop finite volume corrections to both the magnetic moments and the electromagnetic current of the nucleon in the framework of $SU(2)_f$ covariant baryon chiral perturbation theory. We have found that although finite volume corrections to these moments are not negligible, they are not solely responsible for the discrepancies observed in the chiral extrapolation of lattice data [1]. We present the results of these calculations and also a reinvestigation of lattice data published in [2] using the derived finite volume corrections. This work was supported by BMBF and DFG.

References:
[1] L. Greil, T. R. Hemmert and A. Schäfer, in preparation
[2] S. N. Syritsyn et al. (LHP collaboration), J. D. Bratt et al. (LHP collaboration) and T. Yamazaki et al. (RBC and UKQCD collaborations)

T 23.8 Mo 18:30 30.23: 10-1

Chiral extrapolation of nucleon wave function normalization constants — •Philipp Wein, Andreas Schäfer, and Thomas Hemmert — Universität Regensburg

In the framework of two-flavor covariant baryon chiral perturbation theory, we have expressed the Chernyak-Zhitnitsky, Ioffe and Dosch currents in terms of chiral fields to provide leading one-loop extrapolation formulae for the respective leading and next-to-leading twist normalization constants f_N, λ_1 and λ_2. The occurring low energy constants are fitted to data obtained from recent lattice QCD simulations in order to extract the values at the physical point. This work was supported by BMBF and DFG.

T 23.9 Mo 18:45 30.23: 10-1

η,η'-Mesonen in 2+1+1 twisted mass Gitter-QCD — •Konstantin Ottnad und Carsten Urbach — Helmholtz-Institut für Strahlen- und Kernphysik (Theorie) und Bethe Center for Theoretical Physics, Universität Bonn, D-53115 Bonn, Germany

Die Verwendung der twisted mass Formulierung der Gitter QCD er-

laubt es, Simulationen mit einer geraden Anzahl dynamischer Quarks bei automatischer $O(a)$-Verbesserung durchzuführen und somit durch die Analyse geeigneter Korrelationsfunktionen die Eigenschaften von Mesonen auf dem Gitter zu untersuchen. Insbesondere ist es möglich die Quarkmassenabhängigkeit von Mesonmassen zu studieren. Das hier vorgestellte Projekt hat es zum Ziel die Massen der η,η'-Mesonen, das Massensplitting sowie weitere Eigenschaften für vier dynamische Quarkflavors zu untersuchen.