QCDにおける閉じ込め機構と双対性

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2001 Fiscal Year Final Research Report Summary

Confinement mechanism and duality in QCD

Research Project

Project/Area Number

11695029

Research Category

Grant-in-Aid for Scientific Research (B)

Allocation Type

Single-year Grants

Section

一般

Research Field

素粒子・核・宇宙線

Research Institution

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Keywords

Quark confinement / Monopole / Monte-Carlo Simulation / Lattice QCD / Dual transformation / Infrared effective theory of QCD / Finite-temperature phase transition / topplogy

Research Abstract

The following results have been obtained mainly from Monte-Carlo simulation studies using SR8000 (VPP500) at KEK and VPP700 at RIKEN: (1) full QCD : International collaboration with DESY and ITEP groups has begun. Preliminary data shows monopole density is much higer than that in the quenched case. (2) pure SU (3) QCD: Almost perfect monopole action for constrained three monopole currents is fixed. The static potential, the string tension and the glueball mass are evaluated. (3) Gauge (in) dependence of abelian dominance: Gauge independence of the monopole physics are studied using various block-spin transformations with various gauges. (4) Flux of electric field and magnetic current around Abrikosov vortex is measured in SU2 QCD and results are consistent with those of the dual Meissner effect.

(5) Simulations of DGL theory: The electric-field flux distribution is measured in DGL theory numerically which looks similar to that of QCD. (6) T≠0 QCD: From the simulations on anisotropic lattice, monopole actions showing the continuum scaling are obtained. The Coulomb-gas picture of monopoles can describe well non-perturbative effects in the high temperature phase of QCD.
(7) Blocking from the continuum theory is performed successfully. The obtained lattice action is shown to be compatible with that derived numerically.

Research Products (17 results)

All Other

All Publications

[Publications] K.Ishiguro et al.: "Effective monopol acim at finite temperslun in SU(2)"JHEP. 0201. 038-071 (2002)

[Publications] V.Bornyakov et al.: "On the dymics of color magnetic monopoles in full QCD"Nucl. Phys.. 8. (2002)

[Publications] Y.Koma et al.: "Casimir Scaling in a dual superconducling secario"Phys. Rev.. D64. 011501-1-011501-5 (2001)

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[Publications] Katsuya Ishiguro, Tsuneo Suzuki, Tateaki Yazawa: "Effective Monopole Action at Finite Temperature in SU (2) Gluodynamics"JHEP. 0201. 038-071 (2002)

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[Publications] V.Bornyakov, H. Ichie, S. Kitahara, Y. Koma, Y. Mori, Y. Nakamura, M. Polikarpov, G. Schier holz, T. Streuer, H. Stiiben, T.Suzuki: "On the dynamics of color magnetic monopoles in full QCD"to appear in Nucl Phys. B (Proc.Suppl.). hep-lat. (2001)

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[Publications] S.Fujimoto et al.: "A Quantum Perfect Lattice Action for Monopoles and Strings"Phys. Lett.. B476. 437-447 (2000)

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[Publications] K.Yamagishi et al.: "Lattice monopole action in pure SU (3) QCD"JHEP. 02. 012-032 (2000)

[Publications] F.Shoji, T.Suzuki, H.Kodama, A.Nakamura: "A new gauge-fixing method for abelian projection"Phys.Lett.B. 476. 199-204 (2000)

[Publications] F.V.Gubarev, E.-M.Ilgenfritz, M.I.Polikarpov, T.Suzuki: "The lattice SU (2) confining string as an Abrikosov vortex"Phys.Lett.B. 468. 134-137 (1999)

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