International collaboration on the vacuum structure of full QCD using large-scale parallel computers

メタデータ	
	言語: jpn
	出版者:
	公開日: 2021-11-04
	キーワード (Ja):
	キーワード (En):
	作成者: Suzuki, Tsuneo
	メールアドレス:
	所属:
URL	https://doi.org/10.24517/00063423

2005 Fiscal Year Final Research Report Summary

International collaboration on the vacuum structure of full QCD using large-scale parallel computers

Research Project

Project/Area Number

15340073

Research Category

Grant-in-Aid for Scientific Research (B)

Allocation Type

Single-year Grants

Section

一般

Research Field

Particle/Nuclear/Cosmic ray/Astro physics

Research Institution

Kanazawa University

Principal Investigator

SUZUKI Tsuneo　　Kanazawa University, Physics, Professor, 総合メディア基盤センター, 教授 (60019502)

Co-Investigator(Kenkyū-buntansha)

IZUBUCHI Taku　Kanazawa University, Physics, assistant, 自然科学研究科, 助手 (60324068)

Project Period (FY)

2003 – 2005

Keywords

monopole / quantum chromodynamics / quark confinement

Research Abstract

The following results have been obtained mainly from Monte-Carlo simulation studies using SR8000 at KEK and SX7 at RIKEN :
(1)DIK group study of finite-tenperature full QCD :
International collaboration with DESY and ITEP groups. The phase transition temperature is determined on lattices of 16^3X8 and 24^3X10 using an 0(alpha) improved clover fermion action with Nf=2 light quarks. Using the previos data at Nt=4 and Mt=6,we have obtained for the first time the phase transition temperature in the chiral and the continuum limits, although the quark mass used is not light enough. We are continuing the simulations at lighter quark masses using a new BlueGene maschine at KEK.

(2)Gauge invariance of the confinement mechanism :
Confinement is a physical phenomenon and so there must be a gauge-invariant mechanism explaining confinement. Up to now abelian projection methods using some non-local gauges can explain the confinement beautifully as the dual Meissner effect.
Using SX7 at Riken and performing an extensive Monte-Carlo simulations, we have found even in Landau gauge, the abelian dual Meissner effect works good. However in the gauge, there are no abelian monopoles, but instead the magnetic displacement currents squeezes the electric field.
This kind of picture is expected to work in general and so we are doing simulations in various local gauges (known as a bad gauge) to check the expectation.

Research Products (21 results)

	All	2005	2004	2003
		All	Journal Article	

[Journal Article] Vacuum type of SU(2) gluodynamics in maximally Abelian and Ladau gauges	2005 ∨
[Journal Article] Entropy of spatial monopole currents in pure SU(2) QCD at finite temperature	2005 ∨
[Journal Article] The dual Meissner effect and magnetic displacement currents	2005 ∨
[Journal Article] Finite Temperature QCD with Two Flavors of Non-perturbatively Improved Wilson Fermions	2005 ∨
[Journal Article] Monopoles in gluodynamics and Blocking from continuum to lattice	2005 ∨
[Journal Article] Structure of the Gauge Fields inside Baryon	2005 ∨
[Journal Article] Vacuum type of SU(2) gluodynamics in maximally Abelian and Landau gauges	2005 ∨
[Journal Article] The dual Meissner effect and magnetic displacement currents	2005 ∨
[Journal Article] Finite Temperature QCD with Two Flavors of Non-perturbatively Improved Wilson Fermions	2005 ∨
[Journal Article] Monopoles in gluodynamics and Blocking from continuum to lattice	2005 ∨
[Journal Article] Structure of the Gauge Fields inside Baryo	2005 ∨
[Journal Article] Profiles of the broken string in two-flavor QCD below and above the finite temperature transition	2004 ∨
[Journal Article] Monopole Gas in Three Dimensional SU(2) Gluodynamics	2004 ∨
[Journal Article] Dynamics of Monopoles and Flux Tubes in Two-Flavor Dynamical QCD	2004 ∨
[Journal Article] Baryonic Flux in Quenched and Two-Flavor Dynamical QCD fter Abelian projection	2004 ∨
[Journal Article] Matter degrees of freedom and string breaking in Abelian projected quenched SU(2) QCD	2004 ∨
[Journal Article] Determination of monopole condensate from monopole action in quenched SU(2) QCD	2004 ∨
[Journal Article] A detailed study of the Abelian-projected SU(2) flux tube and its dual Ginzburg-Landau analysis	2003 ∨
[Journal Article] Duality of gauge field singularities and the structure of the flux tube in Abelian-projected SU(2) gauge theory and the dual abelian Higgs model	2003 ∨
[Journal Article] Gauge Problem of Monopole Dynamics in SU(2) Lattice Gauge Theory	2003 ∨
[Journal Article] Screening and confinement in U(1)^<N-1> Abelian effective theories	2003 ∨