

研究成果報告書

1 研究組織

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2 当該年度の実施報告の詳細

I study quark confinement due to the monopole condensation in the SU(2) lattice gauge theory. To study this, I have calculated 208 gauge configurations of lattice size $= 32^4$ and $\beta = 2.5115$. The first configuration is obtained after 2000 sweeps of thermalization beginning from a cold start. After obtaining such a state, using MPI code, 16 states are generated at one time, after 100 runs of thermalization given a random seed for each state. Repeating this procedure 13 times, I obtained 208 configurations.

Reviewing the definition of the electro-magnetic field strength, I redefine it so that it satisfies the Ward-Takahashi identity in the lattice gauge theory. Using this redefined field strength, I examined whether there is significant difference between the London penetration lengths derived from the former definition and the redefined one, and there was. This strongly suggests that the London penetration length is an order parameter indicating spontaneous gauge symmetry breaking in the deconfining phase. However the real test of this must be done at finite temperature.

3 口頭研究発表、国際会議等のプロシーディング論文

3.1 口頭研究発表

1. Consistency of lattice definitions of $U(1)$ flux in Abelian projected $SU(2)$ gauge theory, presented at "Lattice 2003", held at Tsukuba, July 15-19, 2003.

3.2 国際会議等のプロシーディング論文

1. T. Matsuki and R.W. Haymaker, Consistency of lattice definitions of $U(1)$ flux in Abelian projected $SU(2)$ gauge theory, Nucl. Phys. 129-130C, pp.641-643.
2. R.W. Haymaker and T. Matsuki, Consistent Definitions of Flux and Electric and Magnetic Current in Abelian Projected $SU(2)$ Lattice Gauge Theory, hep-lat/0310025 (2003), to be published in the proceedings of "Confinement 2003", held at RIKEN, July 21-24, 2003.