Infrared effecticve degrees of freedoms for spatial string tension in finite tempreraturе Lattice QCD

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Quark confinement in quantum chromodynamics (QCD) is an important unsolved problem. Dual superconductivity picture is known as one of approaches to elucidate the quark confinement mechanism. Degrees of freedom of magnetic monopoles, which are not included straight forward in QCD, play a principal role in dual superconductivity picture. In the case of SU(N) gauge theory, However, Degrees of freedom of monopole appear as U(1) components by partial gauge fixing that leaves degrees of freedom of $U^{N-1}(1)$ unfixed[1]. Confinement is characterized by the fact that the potential become linear between a quark and an antiquark. Coefficient of the linear term is called string tension. The string tension becomes small as the temperature increases and it becomes zero at the phase transition temperature. There is a quantity called spatial string tension which is non zero even above the phase transition temperature [2].The mesurement of normal string tension uses Wilson loop which spread through the space direction and time direction. However, The mesurement of spatial string tension uses spatial wilson loop which sperad through the space direction and other space direction. How degrees of freedom of Abelian gauge field and monopoles contribute to the spatial string tension is not obvious. In the case of partial gauge fixing and no gauge fixing, However, Abelian dominance and monopole dominance are confirmed for the normal string tension. We would like to consider the role of Abelian gauge fields and magnetic monopoles in the spatial string tension above deconfinement in finite temperature SU(2) Lattice QCD, by using a random gauge transformation.

[1] G. 't Hooft et al. Nucl. Phys. B190, (1981) 455.

[2] G. S. Bali et al. Phys. Rev. Lett. 71, (1993) 3059.