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SU(3) Dual QCD Formulation and Phase Transition at Finite Temperature

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Based on the well known topological properties of
non-abelian gauge theories, a dual QCD gauge theory is constructed in terms
of magnetic symmetry, which manifest the topological structure of the symmetry group in a non-trivial way. The topological magnetic charges associated with monopoles have been brought into the dynamics by the possible homotopy $\Pi_2[SU(3)/U(1) \otimes U^{'}(1)]$. The dynamical breaking of the magnetic symmetry has been shown to impart
the dual superconducting properties to the magnetically condensed QCD vacuum which ultimately leads to a unique flux tube configuration in QCD vacuum responsible for enforcing the color confinement. The color singlet physical spectrum in accordance with the color confinement has been achieved through the requirement of the color reflection invariance which provides two magnetic glueballs as the collective excitations of the magnetically condensed dual superconducting QCD vacuum which in turn, are intimately connected to the flux confining parameters (penetration length and coherence length) of the superconducting vacuum. Furthermore, in view of the relevance of the phase transitions at finite temperatures, utilizing the path-integral formalism, dual QCD theory has also been extended to the thermal domain to examine the deconfinement phase transition. The effective potential at finite temperature has, thus, been derived to compute the critical temperature for phase transition which has been shown to be in good agreement with the lattice results. A large reduction of color monopole condensate
and glueball masses near the critical temperature has been shown to lead to a first order deconfinement phase transition and the complete evaporation of color monopole condensate in the high temperature domain reveals to the restoration of magnetic symmetry.

On behalf of collaboration:

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