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Thermodynamics of an exactly solvable confining quark model

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In the last years, some works have explored the thermodynamic properties of softly BRST broken pure gauge theories, as the ones that take into account the effect of Gribov ambiguities in the deep infrared regime. The results obtained display clear nonperturbative aspects and indicate that this may be a new pathway for QCD model building.

In this talk, we explore thermodynamic properties of a model of quarks with soft BRST breaking for arbitrary temperatures and quark chemical potentials. This model is expected to describe the infrared properties of confined quarks, while keeping compatibility with ultraviolet QCD properties. Indeed, the analytical propagator of the model displays positivity violation and fits well the available lattice data. The model has been also proven to be renormalizable, reducing to perturbative quarks in the ultraviolet regime. Our goal here is to show not only that confinement in the form of positivity violation in the quark sector implies a well-defined macroscopic behaviour, but also that the tree level model is capable of predicting nontrivial features, being in general qualitatively compatible with the effect of nonperturbative interactions as observed in lattice data.

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