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Center-symmetric effective theory for two-color QCD with massive quarks at nonzero chemical potential

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We revisit the center-symmetric dimensionally reduced effective theory for two-color Yang-Mills theory at high temperature. This effective theory includes an order parameter for center symmetry breaking/restoration and thus allows to broaden the range of validity of the conventional three-dimensional effective theory (EQCD) to lower temperatures, towards the confining phase transition. We extend the previous results by including in the effective theory the effects of massive quarks with nonzero baryon chemical potential. The parameter space of the theory is constrained by leading-order matching to the Polyakov loop effective potential of two-color QCD. Two-color QCD has attracted considerable interest due to the absence of the sign problem, and hence the possibility to probe its phase diagram at nonzero baryon density using standard Monte Carlo simulations. Our effective theory can provide model-independent predictions for the physics above the deconfinement transition, thus bridging the gap between large-scale numerical simulations and semi-analytical calculations within phenomenological models.

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