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Large-N_c behavior of hadronic models at nonzero temperature

Effective hadronic models have been widely used to describe the chiral phase transition. In this work we study the behavior of the critical temperature T_c for the restoration of chiral symmetry as function of the number N_c of colors. We find that T_c increases with Sqrt[N_c]; this scaling contradicts the basic expectations for the chiral phase transition which, just as the deconfinement phase transition, should be independent of N_c. Indeed, in chiral models with quark degrees of freedom T_c scales as N_c^0, as expected. We have modified a hadronic linear sigma model by including a temperature-dependent coupling constant in such a way that the expected large-N_c scaling is recovered. Consequences for the phase diagram are investigated. Finally, we have coupled the linear sigma model to a Polyakov loop in such a way that the chiral phase transition is triggered by the deconfinement phase transition. Also in this case the correct large-N_c results are recovered.

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