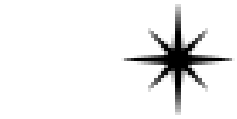

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Thermodynamics of a scale-invariant nonlinear sigma model

A variational resummation technique incorporating renormalization group properties has been proposed as an alternative to solve the scale dependence problem which plagues the evaluation of thermodynamical quantities within the framework of approximations such as HTLpt (Hard Thermal-Loop Perturbation Theory). Here, this new method is used to evaluate the pressure of an interesting theory that naturally displays asymptotic freedom, the nonlinear sigma model (NLSM), which is renormalizable in 1+1 dimensions and also displays trace anomaly and the generation of a mass gap as Yang-Mills theories. Among the works based on this model, its thermodynamics has been evaluated at LO (leading order) and NLO (next to the leading order) within the 1/N expansion as well as within the model calculated on a lattice. However, none of these applications has treated the NLSM scale-invariance. Then our first step within the NLSM was to look for a way in which it could, simultaneously, be subject to the renormalization group properties and the OPT (Optimized Perturbation Theory), using the Renormalization Group Improved OPT (RGOPT) to evaluate the pressure of the NLSM. We show, considering only the first trivial contribution, the convergence of the RGOPT, as well as its scale invariance properties. Therefore, the work presented here supports the RGOPT as a robust nonperturbative method that can eventually be applied to QCD at finite baryonic densities where, so far, LQCD predictions are not possible.

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