

Second look to the Polyakov Loop Nambu-Jona-Lasinio model at finite baryonic density

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We revisit the Polyakov Loop coupled Nambu-Jona-Lasinio model that maintains the Polyakov loop dynamics in the limit of zero temperature, which is of interest for astrophysical applications. For this purpose we re-examine the form of the potential for the deconfinement order parameter at finite baryonic densities. Secondly, and the most important, we explicitly demonstrate that a modification of this potential at any temperature is formally equivalent to assigning a baryonic charge to gluons. In order to avoid this spurious effect we develop a more general formulation of the present model that cures this defect and is normalized to match the asymptotic behaviour of the QCD equation of state given by $\mathcal{O}(\alpha_s^2)$ and partial $\mathcal{O}(\alpha_s^3 \ln^2 \alpha_s)$ perturbative results.

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