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Chiral cross-over in Hadron Resonance Gas model

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We investigate the behavior of the chiral condensate within a Hadron Resonance Gas model, incorporating repulsive mean-field interactions among baryons. By calibrating the strength of these interactions to match the lattice QCD estimations of higher-order baryon charge susceptibilities, we can extend this model to higher baryon densities, where lattice QCD encounters challenges due to the sign problem. Our analysis focuses on estimating the chiral pseudocritical line by studying the temperature dependence of the chiral condensate as a function of μ_B. We describe the crossover line using a parametric form, $T_{pc}(\mu_B)/T_{pc}(0) = 1 - \kappa_2(\mu_B/T_{pc}(0))^2 - \kappa_4(\mu_B/T_{pc}(0))^4$. Our findings yield $\kappa_2 = 0.0150(2)$ and $\kappa_4 = 3.1(6) \cdot 10^{-5}$. The agreement of κ_2 with lattice QCD results is excellent, and our study marks the first identification of a non-negligible κ_4 term within this context. Moreover, the separation between the freeze-out curve and the pseudo-critical line widens at higher densities, suggesting a prolonged hadronic phase at lower collision energies.

Author: BISWAS, Deeptak (National Institute of Science Education and Research (NISER))

Presenter: BISWAS, Deeptak (National Institute of Science Education and Research (NISER))

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