Contribution ID: **49** Type: **not specified**

Strangeness neutrality and QCD phase structure from functional renormalization group

Wednesday 25 September 2024 17:20 (20 minutes)

We improve the $N_f = 2+1$ QCD theory within the functional renormalization group (fRG) approach at finite temperature and chemical potential. Starting from the gluon and quark degrees of freedom in the perturbative high-energy regime, we systematically integrate out quantum fluctuations towards the mesons and baryons degrees of freedom in the low-energy regime with dynamical hadronization. The strange quark and the nonets of scalar and pseudoscalar mesons are self-consistent included. The light quark chiral condensate and the reduced condensate are quantitatively in agreement with the lattice QCD results. Besides, the second order fluctuations and correlation of baryon number and strangeness, i.e. χ_2^B, χ_2^S and χ_{11}^{BS} are also calculated and comparable with the lattica results. The QCD phase structure is given with constraints $\mu_S = 0$ and $n_S = 0$.

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Session Classification: Parallel A