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Evolution of critical fluctuations in a heavy-ion collision scenario

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We study fluctuations of the sigma field and the net-baryon number on the crossover side of the critical point within the model of nonequilibrium chiral fluid dynamics (NχFD). Herein, the sigma field as the chiral order parameter is propagated explicitly and coupled to a fluid of quarks. Before investigating these fluctuations in an expanding nonequilibrium medium, we scrutinize the NχFD model by comparing cumulants of the sigma and net-baryon number fluctuations in a thermalized box to (ratios of) susceptibilities as they are obtained from derivatives of the grand canonical potential. The dynamically determined cumulants follow the trend of the thermodynamic susceptibilities. After implementing a particlization procedure into this model, we study the behavior of the net-proton kurtosis in the critical region and find that it shows the typical shape around the pseudocritical temperature. This demonstrates how critical fluctuations are able to develop in a realistic heavy-ion collision scenario and, moreover, have observable consequences. Finally, we present results for different rapidity windows and transverse momentum cuts.

Preferred Track

QCD at High Temperature

Collaboration

Not applicable

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