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The evolution of the net-proton kurtosis in the QCD critical region

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We present an analysis of the net-proton kurtosis and the chiral kurtosis on the crossover side near the critical point in the model of nonequilibrium chiral fluid dynamics. The chiral order parameter is propagated explicitly and coupled to an expanding fluid of quarks and gluons to describe the dynamical situation in a heavy-ion collision. We aim at disentangling two distinct sources of fluctuations, event-by-event fluctuations from the initial state and critical fluctuations. This is achieved by comparing a mean-field evolution of averaged thermodynamic quantities with an evolution where we allow for fluctuations at the phase transition. We find that only through dynamically produced critical fluctuations, a clear structure of the phase transition can develop in the net-proton kurtosis. The signals of the critical point in the net-proton and chiral kurtosis are affected by the nonequilibrium dynamics and the inhomogeneity of the space-time evolution but develop clearly.

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