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Dynamics of coupled baryon, electric charge and strangeness fluctuations in expanding heavy-ion collision.

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Fluctuation observables in heavy-ion collisions probe the medium constituents, the chemical freeze-out and the transport properties of strongly interacting matter, and signal phase transitions. However, diffusion in the medium may blur some of the expected signals. It is thus crucial to understand the diffusive dynamics of the conserved charge fluctuations to know to which degree measured fluctuations report bulk fluctuations during the evolution.
Two major ingredients determine the dynamical evolution of the fluctuations, the natural coupling between the diffusive properties of the conserved charges and the longitudinal expansion of the medium. Their non-trivial interplay largely impacts the in- or out- of equilibrium nature of the fluctuations.
We present the coupled diffusive dynamics of net-baryon, net-charge and net-strangeness fluctuations in a rapidly expanding medium. The model consists of a set of three coupled stochastic diffusion equations. The diffusion matrix comes from microscopic calculations both in the hadron phase and in the QGP. We particlize the density fluctuations in order to obtain fluctuations in particle numbers, which reflect the cross-correlations between the charges. Special emphasis is put on the Lambda fluctuations. The phenomenological consequences on the determination of the freeze-out condition determination via strangeness observables are discussed.

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