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Non-Markov effect on time evolution of conserved-charge fluctuations in heavy ion collisions

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It is suggested that fluctuations of conserved charges in a given rapidity window contain information on the properties of the QGP created in heavy ion collisions. This is because these fluctuations can relax to the thermal hadronic value only due to charge diffusion in the hadronic stage and cannot change from thermal QGP value immediately.

We discuss the non-Markov effects on the time evolution of higher order cumulants of conserved charges for the first time in order to describe diffusion phenomena in heavy ion collisions and to relate the observables to these properties of the QGP in a more realistic way.

Specifically, we obtain charge fluctuations with non-Markov effects from the solution of Cattaneo equation and also directly from Langevin equation for phase space and compare both results. In addition, we show that Cattaneo equation is derived from Langevin equation by eliminating the fast variable.

We also discuss the non-Markov nature of the rapidity window dependences of charge fluctuations, which are experimental observables in heavy ion collisions, in detail.

On behalf of collaboration:

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