

Fluctuations in the mixed phase of the first order phase transition and nucleus-nucleus collisions

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We present the analytic description of particle number (conserved charge) fluctuations within the subvolume of the thermal system in the coexistence region of the first order phase transition. Different approximations are applied for the metastable states, for the region of spinodal decomposition [1] and in the special case of a homogeneous system [2]. The results are checked within non-relativistic molecular dynamics with Lennard-Jones potential. We these results in the context of event-by-event fluctuations in heavy ion collision experiments. Within the UrQMD transport model with interaction potential, we show that the enhancement of fluctuations in the region of a first order phase transition persists to late times of the nucleus-nucleus collision [3].

The presence of the phase transition has a much smaller influence on event-by-event fluctuations in the momentum space, where a notable effect is observed only in high-order cumulants, namely, in kurtosis.

[1] V.Kuznietsov, O.Savchuk, R.P., V.Vovchenko, M.I.Gorenstein, in preparation

[2] R.P, O.Savchuk, M.I.Gorenstein, V.Vovchenko, H.Stoecker, Phys.Rev.C 103 (2021) 2, 024912

[3] O.Savchuk, A.Motornenko, R.P., J.Steinheimer, V.Vovchenko, M.I.Gorenstein, S.Pratt, T.Galatyuk, in preparation

Co-authors: GORENSTEIN, Mark (Bogolyubov Institute for Theoretical Physics); Mr SAVCHUK, Oleh (Frankfurt Institute for Advanced Studies); Mr KUZNIETSOV, Volodymyr (Bogolyubov Institute for Theoretical Physics of the National Academy of Sciences of Ukraine); Dr VOVCHENKO, Volodymyr (Lawrence Berkeley National Laboratory)

Presenter: POBEREZHZHNYUK, Roman (Bogolyubov Institute for Theoretical Physics)

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