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Longitudinal fluctuations of anisotropic flows and flow correlations

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In relativistic heavy-ion collisions, event-by-event fluctuations in the transverse plane in the initial states of quark-gluon plasma (QGP) could lead to anisotropic flows of the final hardons, which has been successfully described by relativistic hydrodynamics simulation. On the other hand, the initial states fluctuations in the longitudinal direction could lead to the fluctuations and decorrelations (factorization breaking) of anisotropy flows in the pseudorapidity direction [See e.g., 1, 2]. Detailed study of initial state fluctuations and their manifestations in the final-state flows and flow correlations can provide insights into the initial states and dynamical evolution of the hot and dense QGP.

In this work [3], we perform a detailed analysis on initial-state longitudinal fluctuations, the pseudorapidity dependence of anisotropic flows and the longitudinal decorrelations of anisotropic flows in heavy-ion collisions at RHIC and the LHC. The dynamical evolution of the QGP is simulated via a (3+1)-dimensional hydrodynamics model [4]. To study the dependence on initial conditions, we utilize two initial condition models: the AMPT model and a Monte-Carlo Glauber based model with longitudinal fluctuations. For longitudinal fluctuations and decorrelations, the individual contributions from flow magnitudes and flow angles are investigated. The comparison to the ALICE, ATLAS and CMS data is also performed. We also study the correlations among anisotropic flows of different orders, such as flow angle correlations and symmetric cumulants. The pseudorapidity dependence of flow correlations is studied as well.

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[2] Long-Gang Pang, Hannah Petersen, Guang-You Qin, Victor Roy, Xin-Nian Wang, Eur.Phys.J. A52 (2016) no.4, 97.

[3] X.-Y. Wu, L.-G. Pang, G.-Y. Qin, X.-N. Wang, in preparation.

[4] Longgang Pang, Qun Wang, Xin-Nian Wang, Phys.Rev. C86 (2012) 024911.

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Primary authors: WU, Xiang-Yu (Central China Normal University.); PANG, Long-Gang (lbnl); QIN, Guang-You (Central China Normal University); WANG, Xin-Nian (Lawrence Berkeley National Lab. (US))

Presenter: WU, Xiang-Yu (Central China Normal University.)

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