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Study of nonlinear flow and symmetric cumulants in large and small systems (for ALICE Collaboration)

Anisotropic flow phenomena is a key probe of the existence of Quark-Gluon Plasma. The second and the third order anisotropic flow, V_2 and V_3 , are mostly determined by the corresponding initial spatial anisotropy coefficients, e_2 and e_3 , in the initial density distribution. In addition to their dependence on the same order initial anisotropy coefficient, higher order anisotropic flow, V_n ($n > 3$), can also have a significant contribution from lower order initial anisotropy coefficients, which leads to mode-coupling effects. Several new observables associated with correlations between anisotropic flow harmonics, i.e., symmetric cumulants are developed, which are expected to be sensitive to the initial fluctuations and transport properties of the created matter in heavy ion collisions.

Small collision systems, such as proton-proton and proton-lead, are usually used to provide the reference data for collisions of heavy nuclei. However, inspection of high multiplicity pp interactions revealed surprising features, usually attributed to collective effects in heavy-ion collisions. Thus, one of the main goals of this work is to understand these unexpected observations.

We will show in this talk the recent developments of nonlinear flow response and symmetric cumulants.

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