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Initial condition fluctuations in heavy ion collisions

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We investigate the effect of event-by-event fluctuations and the degree of granularity in the initial conditions on the collective evolution of matter created in heavy-ion collisions using fluid dynamics. Motivated by the glasma-flux-tube scenario, we model the initial condition by a set of randomly distributed longitudinal tubes in a boost-invariant 2D geometry. The model introduces two parameters: the number of tubes in each event and the transverse (gaussian) width in energy density of a tube. The number of tubes fluctuates event by event and the width of the tubes introduces a granularity to the initial condition. Both parameters strongly affect the hydrodynamical evolution. For instance, we observe that the increasing granularity reduces the slope of the transverse momentum spectra, decreases the value of the differential elliptic flow at the average transverse momentum, and generates a double-peak structure in the two-particle distribution. With this framework, we aim to constrain the initial condition of a heavy-ion collision by performing a systematic analysis of the effects of each parameter on the final observables.

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