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"Transverse hydrodynamization" in high-energy nuclear collisions

We explore the emergence of collective behavior in a weakly-coupled quark-gluon plasma using relativistic kinetic theory. To model the plasma formed in central high-energy nuclear collisions, we consider a system that expands boost-invariantly along the longitudinal (beam) direction and develops azimuthally symmetric transverse flow. Using the Boltzmann equation and a special set of moments of the kinetic distribution function, we analyze the interplay between longitudinal and transverse dynamics of the matter, describing the transition from early-time far-off-equilibrium regime to near equilibrium hydrodynamic regime. We show that, while the rapid longitudinal expansion of the system strongly hinders the approach to hydrodynamic regime, only a few scatterings among particles can reproduce hydrodynamic-like behavior in the transverse plane. We discuss the implications of this behavior for understanding collective phenomena in heavy-ion collisions and also in small systems.

Category

Theory

Collaboration (if applicable)

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