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New formulation of leading-order anisotropic hydrodynamics

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In ultrarelativistic heavy-ion collisions nuclear matter is heated to a temperature exceeding that necessary to create a quark-gluon plasma (QGP). Traditionally, second order viscous hydrodynamics has been used to reproduce the soft collective flow of the QGP and hadronic spectra; however, due to rapid longitudinal expansion in the early stages of evolution, the system may possess substantial pressure anisotropies which are a consequence of large viscous corrections. These large corrections may lead to unphysical results. In order to more accurately treat systems possessing large pressure anisotropies, a new approach called anisotropic hydrodynamics was recently developed. In this approach, the pressure anisotropy is treated non-perturbatively at leading order in the hydrodynamic expansion. This allows one to match with second order viscous hydrodynamics in the close to equilibrium limit and to also have a striking agreement with the exact solution for large anisotropies. We are presenting the latest formulation of the leading-order for anisotropic hydrodynamics, which uses a general ellipsoidal ansatz for the underlying distribution function, and dynamical equations resulting from the moments of the Boltzmann equation. Differently from previous approaches, we don't require any symmetry for the flow, like longitudinal boost invariance or cylindrically symmetric radial flow.

References

[1] L. Tinti, (3+1)-dimensional framework for leading-order non conformal anisotropic hydrodynamics, arXiv:1411.7268.

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