Contribution ID: 60

Type: 口头报告

Attractor of hydrodynamics with general rapidity distribution

Sunday, 27 April 2025 09:00 (20 minutes)

The thermalization of the hot and dense QGP created in heavy-ion collisions is a crucial theoretical question in understanding the onset of hydrodynamics. One hypothesis to explain the rapid decrease in the degrees of freedom is the concept of a hydro attractor. In existing studies, the hydrodynamical solution shows the attractor behavior with respect to the proper time in Milne coordinate. However, in rapidity dependent systems, there has been no observation of such consistency of different hydrodynamical solutions at later time evolution.

We observe, for the first time, attractor behavior for 1+1D viscous hydrodynamics with general rapidity distribution based on Muller–Isreal–Stewart hydrodynamic theory [1]. This is achieved by redefining generalized attractor variables as a covariant formula of pressure anisotropy and replacing the proper time by the inverse of expansion rate $(1/(\mathcal{D}_{\mu}u^{\mu}))$. We also observe that a rapid expansion in the fluid velocity is essential for a rapid early time attractor.

To verify the attractor behavior evolving with aforementioned redefined variables, we further establish the anisotropic hydrodynamics (aHydro) equations based on a specific boost-non-invariant longitudinally expanding system [2]. Good consistency is also found in the comparison between the aHydro results with those from the analytical solution to the Boltzmann equation under relaxation time approximation [3]. To the best of our knowledge, [2] and [3] are respectively the first exact solution to the Boltzmann equation and aHydro equations that allow longitudinal expansion with broken boost invariance.

Reference:

- [1] Shile Chen and Shuzhe Shi, Phys. Rev. C 111, no.2, L021902 (2025).
- [2] Shile Chen and Shuzhe Shi, Phys. Rev. D 111, no.1, 014001 (2025).
- [3] Shile Chen and Shuzhe Shi, Phys.Rev.C 109 (2024) 5, L051901.

Primary authors: SHILE, Chen (Tsinghua University); SHI, Shuzhe (Tsinghua University)

Presenter: SHILE, Chen (Tsinghua University)

Session Classification: 分会场一