

QPT 2021

Guiyang, China

Contribution ID: 49

Type: **not specified**

Attractor solutions and the onset of non-conformal fluids in QGP

The onset of non-conformal fluid dynamics in the early stages of heavy-ion collisions is a key to understand the collective behavior in small colliding systems, such as proton-lead and proton-proton. We consider a small mass correction m/T , which corresponds to the realistic quark masses, to break conformal symmetry in QGP. By solving the pre-equilibrium evolution of the shear and the bulk modes in the Bjorken flow, we find that the well-known attractor behavior of the system evolution in conformal hydrodynamics is modified. Especially, in comparison to a pure conformal fluid, the early-time attractor is suppressed, partly as consequence of an extra fixed point in the early-time free-streaming dynamics. We also find that the gradient expansions for the shear and the bulk modes are both asymptotic, but exotic properties emerge when Borel resummation is carried out. The effect of shear-bulk coupling on the pre-equilibrium non-conformal system evolution is addressed as well.

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