

Dynamics near QCD critical point by dynamic renormalization group

We study the critical dynamics near QCD critical point (CP) by dynamic renormalization group (RG).

As a basic equation for the critical dynamics, we construct the nonlinear Langevin equation, which is a standard dynamic equation for a CP in condensed matter physics.

Our construction is based on the generalized Langevin equation and the relativistic hydrodynamics.

Applying the dynamic RG to the constructed equation, we derive the RG equation for the transport coefficients and obtain their critical exponents.

We find that the resulting RG equation turns out to be the same as that for the liquid-gas CP, although the Langevin equations for the two critical points are different.

Therefore, the bulk viscosity and the thermal conductivity strongly diverge at the QCD CP.

We also show that the thermal and viscous diffusion modes exhibit critical slowing down.

In contrast, the sound mode shows critical speeding up.

Reference

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