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Critical dynamics of phase transition in the QCD phase diagram within the real-time fRG approach

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The Schwinger-Keldysh functional renormalization group (fRG) is employed to investigate critical dynamics of Model A and Model H that is related to second-order phase transition in the QCD phase diagram. The purely dissipative relaxation of a non-conserved field is described in Model A. The effective action of model A is expanded to the order of $O(\partial^2)$ in the derivative expansion for the $O(N)$ symmetry. A conserved order parameter coupled to transverse momentum density is contained in Model H which describes the gas-liquid and binary-fluid transitions. According to the dynamic scaling analysis, Model H and QCD critical end point belong to the same dynamic universality class in the critical region. The higher-order correction of the transport coefficient $\bar{\lambda}$ and shear viscosity $\bar{\eta}$ coming from the mode-couplings contribution are obtained by calculating the two-point correlation functions. Finally, the dynamical critical exponent z are obtained as a function of the spatial dimension d.

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