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Kadanoff-Baym approach to nonequilibrium field theories with kinetic entropy AKIHIRO NISHIYAMA, Institute of physics, University of Tokyo — Recent phenomenological analysis of hadron production in ultrarelativistic nucleus-nucleus collisions at RHIC in terms of hydrodynamic model suggests that local thermalization is achieved very rapidly in dense matter created by the collision, much earlier than the time scale which has been expected from naive parton cascade picture. This poses a difficulty of applying the Boltzmann equation with usual binary collision term to describe the early thermalization process. We apply the relativistic Kadanoff-Baym (KB) theory to describe the time evolution of the gluonic matter produced by ultrarelativistic nucleus-nucleus collision. The merit of this approach is that it can incorporate the off-shell quantum evolution of partons as well as the memory effect in the collision process, both of these effects are usually ignored in the Boltzmann equation approach. As a preparatory step of our research, we study the non-equilibrium quantum evolution of the model systems described by scalar field theories. We present the analytic proof of the H-theorem with the relativistic KB equation and derive an equation to describe the entropy production. Numerical solutions of these equations are discussed.

Akihiro Nishiyama
Institute of physics, University of Tokyo

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