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Transport Model Approach to Quark-Gluon Plasma Equilibration

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The thermalization and chemical equilibration processes of the gluon dominated matter produced immediately after high energy collision are still poorly understood due to its far-from equilibrium nature. We use transport simulation to explore this phase where we include 2-to-3 interactions which are important to the thermal and chemical equilibration processes as the source of particle and entropy production. We prepare the initial condition for Au-Au at √s‘= 200 GeV in a far from equilibrium state with the mini-jet model inside a box with fixed length and periodic boundary condition. The transport model is based on hadronic transport model SMASH modified to be used with parton case Chemical equilibration is driven by quark-antiquark production/annihilation from gg ⟶ qqbar channel and gluon radiation/absorption process from gg ⟶ ggg, qg ⟶ qgg, and qq ⟶ qqg channels. Compared to previous models which often focused on exclusively gluon-only gluon absorption and radiation processes, here we added two new gluon absorption/radiation channels and analyze the effect of these two channels on the equilibration process. By using small fixed QCD coupling constant, we assume that perturbative QCD is still valid at relatively lower energy region and the energy spectrum of the ensemble in thermal equilibrium state approaches Boltzmann distribution function.

Theory / experiment

Theory

Group or collaboration name

Primary author: Mr ABDI, Cendikia (Hiroshima University)

Co-author: NONAKA, Chiho

Presenter: Mr ABDI, Cendikia (Hiroshima University)

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