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Charm quark transport within viscous QCD medium : colliding and radiating

Content

Charm quarks, created during an early stage of the heavy-ion collision via hard scattering, have a large thermalization time within quark-gluon plasma (QGP) due to their large mass. They witness the entire evolution of QGP and hence can be used as an effective probe to study the strongly interacting matter. We studied the effect of collision and gluon radiation by charm quark on its transport coefficients, namely, drag and momentum diffusion within perturbative QCD and kinetic theory for viscous QCD medium. The thermal medium effects are incorporated through the effective fugacity quasi-particle model which is based on the lattice QCD equation of state. The effective modeling of the QCD medium modifies the momentum distribution function of the QGP constituent particles, i.e. light quarks, anti-quarks, and gluons by the introduction of a temperature-dependent effective fugacity parameter. Viscous corrections to charm quark transport coefficients due to shear and bulk viscosities of the medium are incorporated at leading order in the thermal distribution function by solving effective Boltzmann equation within relaxation time approximation. We found that the soft gluon radiation has a substantial effect on the transport coefficients of the charm quark within viscous QGP, and the results may have a significant impact on the experimental observables like the nuclear suppression factor and elliptic flow of charmed hadrons.

Summary

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