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Coupled Transport Equations for Quarkonium Production in Heavy Ion Collisions

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The production of heavy quarkonium in heavy ion collisions has been used as an important probe of the quark-gluon plasma. To describe the in-medium evolution of quarkonium, one has to take into account plasma screening effects and recombination in a consistent way. Many previous studies calculate dissociation rates from QCD but use recombination models that are based on detailed balance or coalescence. Thus the implementations of dissociation and recombination are not in the same theoretical framework.

Motivated by the recent developments in applying open quantum system to study quarkonium in-medium dynamics, we construct a set of coupled transport equations of open heavy quarks and quarkonia. In our framework, both dissociation and recombination rates are calculated from QCD. The recombination process depends on real-time distributions of open heavy quarks. An important feature of our implementation of recombination is the cross-talk recombination: an excited quarkonium state that dissociates early in the evolution when the plasma is hot may recombine into the ground state shortly after the dissociation and vice versa when the temperature drops. In this talk, we will show new phenomenological results on Upsilon production based on our coupled transport equations approach, with an improved treatment of feed-down contributions in the hadronic stage. We will also discuss the importance of the cross-talk recombination in phenomenology.

Collaboration (if applicable)

Track

Heavy Flavor and Quarkonia

Contribution type

Contributed Talk

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