Quark Matter 2014 - XXIV International Conference on Ultrarelativistic Nucleus-Nucleus Collisions

Contribution ID: **53** Type: **Contributed Talk**

Heavy-flavor evolution in QGP and hadron gas: suppression, flow and angular de-correlation

Monday, 19 May 2014 16:50 (20 minutes)

Heavy flavor hadrons serve as valuable probes of the transport properties of the quark-gluon plasma (QGP) created in relativistic heavy-ion collisions. We introduce a comprehensive framework that describes their full-time evolution in the QGP matter and the subsequent hadronic phase. The heavy quark energy loss in a de-confined QCD medium is modeled with our improved Langevin approach [1] that simultaneously incorporates quasi-elastic scattering [2,3] and medium-induced gluon radiation [4]. The subsequent transport of heavy mesons in the hadron gas phase is described within the ultra-relativistic quantum molecular dynamics (UrQMD) model [5]. The intermediate hadronization process from heavy quarks to their respective mesonic bound states is calculated with our hybrid fragmentation plus coalescence model [1].

We investigate the relative contribution of each of these ingredients to the final-state spectra of heavy mesons and demonstrate that while quasi-elastic scattering dominates heavy quark energy loss in the QGP at low energies, contributions from gluon radiation at high energies are significant; the coalescence process is found important for heavy meson production at intermediate transverse momenta; and the subsequent hadronic interactions is equally crucial as the free quark evolution inside QGP for the development of heavy flavor suppression and collective flow behaviors that one observes. Within this newly developed framework, we provide a good description of D meson suppression and flow measured at both RHIC and LHC, as well as predictions for the future measurements of B mesons.

In addition, a new set of observables –heavy-flavor-tagged angular correlation functions –are explored and found to be potential candidates for distinguishing different energy loss mechanisms of heavy quarks inside a QGP medium [6]. We calculate correlation functions for D-D, D-e, D-hadron, e-hadron, etc., some of which can be compared to the existing preliminary data from LHC experiments.

1. S. Cao, G.-Y. Qin, and S. A. Bass, Phys. Rev. C88, 044907 (2013).
2. G. D. Moore and D. Teaney, Phys. Rev. C71, 064904 (2005).
3. S. Cao and S. A. Bass, Phys. Rev. C84, 064902 (2011).
4. B.-W. Zhang, E. Wang, and X.-N. Wang, Phys. Rev. Lett. 93, 072301 (2004).
5. S. A. Bass, et al., Prog. Part. Nucl. Phys. 41, 255-369 (1998).
6. S. Cao, G.-Y. Qin, S. A. Bass and B. Mueller, J. Phys. Conf. Ser. 446, 012035 (2013).

Primary authors: QIN, Guang-You (Central China Normal University); CAO, Shanshan (Duke University); Prof. BASS, Steffen A. (Duke University)

Presenter: CAO, Shanshan (Duke University)

Session Classification: Heavy flavor

Track Classification: Open Heavy Flavour and Quarkonia