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# A comprehensive study of open heavy flavor transport and hadronization in heavy-ion collisions

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Heavy quarks serve as a clean probe of the quark-gluon plasma (QGP) produced in high-energy nuclear collisions. They are primarily generated from early-stage hard scatterings and retain information about the entire evolution of the QGP fireball. We have developed a state-of-the-art model to provide a comprehensive description of the heavy quark evolution in a realistic QGP medium from the heavy quark's production in the initial stages of the collision all the way to hadronic freeze-out.

The transport of heavy quarks in the QGP medium is described by a Langevin-based transport model that has been augmented to incorporate medium-induced radiation. This transport model is coupled to a bulk evolution model based on 2+1D relativistic viscous fluid dynamics. The heavy quark transport coefficients are derived from non-perturbative T-matrix calculations, which account for resonant correlations near the QGP transition temperature. Hadronization of the heavy quark is described by a fragmentation plus coalescence model. We utilize the resonance recombination model that satisfies energy conservation and provides an equilibrium mapping between quark and meson distributions. The recombination probabilities are derived from resonant heavy-quark scattering rates.

We report on key observables in open heavy flavor physics, including the nuclear modification factor, elliptic flow, baryon-to-meson ratio, as well as D-Dbar angular correlations and compare our results to experimental data from the ALICE collaboration in Pb-Pb collisions at 5 TeV.

## Category

Theory

## Collaboration (if applicable)

Topical Collaboration in Nuclear Theory on Heavy-Flavor Theory (HEFTY) for QCD Matter

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