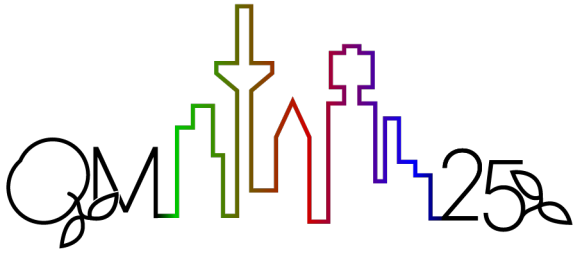

Contribution ID: **747** Type: **Oral**

Pre-equilibrium charm quark dynamics and their impact on D-Meson observables

Charm quarks offer valuable insights into the properties and evolution of the QCD medium as they are generated in the initial moments of energetic heavy-ion collisions at Relativistic Heavy-Ion collider (RHIC) and Large Hadron Collider (LHC). In particular, they can carry signals from the pre-equilibrium stage since the very high energy density of this stage can result in significant charm-medium interaction. Using a hybrid simulation framework that combines the IP-Glasma model for initial-state with viscous hydrodynamic evolution MUSIC to model the medium, we study charm quark propagation through different stages of the collision, from pre-equilibrium to hadronization. Heavy quark initial production is generated using PYTHIA and their interactions within the pre-equilibrium and hydrodynamic medium are modeled through Langevin dynamics in MARTINI. Our results reveal that both the nuclear modification factor and anisotropic flow coefficients of D-mesons in Pb+Pb collisions at $\sqrt{s_{NN}} = 5.02$ TeV are sensitive to the momentum-dependent energy loss of charm quarks in the initial stages. Furthermore, we demonstrate that hadronization mechanisms—specifically fragmentation and coalescence—play a crucial role in shaping the final-state charm observables.

Category

Theory

Collaboration (if applicable)

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