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Multi-scale evolution of heavy flavor in the QGP

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Shower development dynamics for a jet traveling through the quark-gluon plasma (QGP) is a multi-scale process, where the heavy flavor mass is an important scale. During the high virtuality portion of the jet evolution in the QGP, emission of gluons from a heavy flavor is modified owing to heavy quark mass. In-medium stimulated radiation of heavy flavor is sensitive to microscopic processes (e.g. diffusion), whose virtuality dependence is phenomenologically explored in this study. In the lower virtuality part of shower evolution, i.e. when the mass is comparable to the virtuality of the parton, scattering and radiation processes of heavy quarks differ from light quarks. The effects of these mechanisms on shower development in heavy flavor tagged jets in the QGP is explored here. Furthermore, our multi-scale study examines dynamical pair production of heavy flavor (via virtual gluon splittings) and their subsequent evolution in the QGP, which is not possible otherwise. A realistic event-by-event simulation is performed using the JETSCAPE Framework. Energy-momentum exchange with the medium proceeds using a weak coupling recoil approach. Using leading hadron and open heavy flavor observables, differences in various heavy quark energy-loss mechanisms are explored, while the importance of heavy flavor pair production is highlighted along with future directions to study. Preliminary Bayesian constraint of parton momentum diffusion in the QGP is shown using light and heavy flavors.

Experiment/Theory

Theory/Phenomenology

Affiliation

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Sitzung Einordnung: Parallel: Heavy Flavours & Quarkonia

Track Klassifizierung: Heavy flavor and quarkonia