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Effects of drag induced radiation and multi-stage evolution on heavy quark energy loss

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Heavy quarks serve as ideal probes of the QGP properties produced in energetic nuclear collisions, and provide a unique opportunity to study the mass effects on parton energy loss. We develop a multi-stage approach [1,2] for heavy quark evolution inside the QGP, in which heavy quarks first undergo a rare-scattering multiple-emission evolution at momenta large compared to their mass (sensitive only to the transverse diffusion coefficient $\hat{q}$), and then evolve through a single-scattering induced emission (Gunion-Bertsch) stage at momenta comparable to their mass [sensitive to not only $\hat{q}$, but also the longitudinal drag $\hat{e}$ and diffusion $\hat{e}_2$ coefficients]. This multi-stage approach is coupled to a (2+1)-D viscous hydrodynamic model for a quantitative investigation of charm vs. beauty quark energy loss inside the QGP. Based on this approach, we find that drag induced radiation has a considerable impact on the energy loss of intermediate p_T massive beauty quarks. This effect increases the suppression of B mesons and narrows the difference between the R_{AA} of B and D mesons. Our results are consistent with the experimental data at the LHC and contribute to a more quantitative understanding of the transverse momentum dependence of the mass hierarchy of parton energy loss inside the QGP.

[1] S. Cao, A. Majumder, G.-Y. Qin and C. Shen, arXiv:1711.09053.

[2] S. Cao, et. al., Phys. Rev. C96 (2017) no.2, 024909

Summary

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