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Heavy quark transport coefficients in a viscous QCD medium with collisional and radiative processes

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Heavy quarks (charm and bottom) are created during an early stage of the heavy-ion collision via hard scattering. Due to their large mass, they do not get thermalized with the constituents of the quark-gluon plasma (QGP) over the lifetime of the plasma. Hence, they witness the evolution of QGP and are useful probes to study the strongly interacting matter. Heavy quark transport coefficients are sensitive to the interaction with the QGP medium and the estimation of the drag and diffusion coefficients of heavy quarks in the hot QCD medium is of interest. We investigate the effects of the collision and soft gluon radiation by heavy quark on the transport coefficients (e.g., drag and diffusion coefficients) within the ambit of perturbative QCD and kinetic theory for a viscous QGP utilizing the effective fugacity quasi-particle model (EQPM) which models the hot QCD medium based on the lattice QCD equation of state [1]. This modifies the momentum distribution function of the QGP constituent particles, i.e., light quarks, anti-quarks and gluons by introducing a temperature-dependent effective fugacity parameter. Viscous corrections to heavy quark transport coefficients due to shear and bulk viscosities of the medium are incorporated at leading order in the thermal distribution function of in-medium particles [2]. We observe that the soft gluon radiation substantially affects the heavy quark transport coefficients in the viscous QGP medium. The effect of introducing next-to-leading order viscous corrections to the heavy quark transport coefficients is in progress for both collisional and radiative processes.

References:
[1] A. Shaikh et al. In: Phys. Rev. D 104 (2021) 3, 034017.
[2] A. Shaikh et al. In: PoS CHARM2020 (2021) 060.

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