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Perturbative and non-perturbative interaction between heavy quarks and a plasma of quasi quarks and gluons.

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Both ALICE and CMS collaboration report precision measurements of nuclear suppression and collective flow of heavy flavor hadrons at low and intermediate transverse momentum region in PbPb collisions, which drives the theoretical development of the non-perturbative scatterings between heavy quarks and QGP medium. Aim at this, we have improved the LBT model by re-evaluating the heavy quark scattering rates including both perturbative Yukawa and non-perturbative color confining interactions between heavy quarks and thermal partons inside the QGP. In this work, we further incorporate the non-perturbative dynamics of the QGP system by modeling the QGP as a collection of thermalized quasi-particles, and the thermal masses of quasi-particles are related to the screening mass parameter m_d of Yukawa potential. We have fitted the thermal masses of quasi-particles through a Bayesian calibration on the lattice QCD equation of state. By combining this updated model with the (3+1)-dimensional hydrodynamic model CLVisc and a fragmentation-coalescence model for heavy quark hadronization, we achieve a simultaneous description of experimental data on the nuclear modification factor R_{AA} and elliptic flow v_2 of D mesons. We also explore the effects of the improved non-perturbative scatterings between heavy quarks and QGP medium on the key transport properties, such as the diffusion coefficient D_s. This also can provide another comparison to the latest results of D_s from lattice QCD calculation.

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