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Exploring jet transport coefficients in the strongly interacting quark-gluon plasma

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We study the interaction of leading jet partons in a strongly interacting quark-gluon plasma (sQGP) medium based on the effective dynamical quasi-particle model (DQPM). The DQPM describes the non-perturbative nature of the sQGP at finite temperature T and baryon chemical potential μ_B based on a propagator representation of massive off-shell partons (quarks and gluons) whose properties (characterized by spectral functions with T, μ_B dependent masses and widths) are adjusted to reproduce the lQCD EoS for the QGP in thermodynamic equilibrium. We present the results for the jet transport coefficients, i.e. the transverse momentum transfer squared per unit length $\hat{q}$, the drag coefficient $\mathcal{A}$ as well as the energy loss per unit length $\Delta E = dE/dx$, in the QGP and investigate their dependence on the temperature T and baryon chemical potential μ_B as well as on jet properties such as the leading jet parton momentum, mass, flavor, and the choice of the strong coupling constant. Firstly, the elastic scattering processes of a leading jet parton with the sQGP partons are explored discarding the radiative processes (such as gluon Bremsstrahlung) which are expected to be suppressed for the emission of massive gluons. Then we compute the cross sections and transport coefficients for radiative processes as well and compare the contributions from elastic partonic scattering and radiative processes for the emission of massive gluons.
We also present a comparison of our results for the elastic energy loss in the sQGP medium with the pQCD results obtained by the BAMPS model as well as with other theoretical approaches such as lattice QCD and the LBT model and also with estimates of $\hat{q}$ by the JET and JETSCAPE Collaborations based on a comparison of hydrodynamical calculations with experimental heavy-ion data.

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