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Application of Gribov quantization in deconfined nuclear matter

Gribov quantization is a method to improve the infrared dynamics of Yang-Mills theory. We study the thermodynamics and transport properties of a plasma consisting of gluons whose propagator is improved by the Gribov prescription. We first construct the thermodynamics of Gribov plasma using the gauge-invariant Gribov dispersion relation for interacting gluons. When the Gribov parameter in the dispersion relation is temperature-dependent, one expects a mean-field correction to the Boltzmann equation. We formulate a covariant kinetic theory for the Gribov plasma and determine the mean-field contribution in the Boltzmann equation. This leads to a quasiparticle-like framework with a bag correction to pressure and energy density, mimicking confinement. The temperature dependence of the Gribov parameter and bag pressure is fixed by matching lattice results for a system of gluons. The quark contribution is considered using the usual quasiparticle approach. Finally, we calculate the temperature dependence of the transport coefficients, i.e., bulk and shear viscosities for both gluon plasma and the QGP case.

Recently, we have also studied the heavy quark diffusion coefficient in a Gribov plasma, and we get good agreement with the available lattice data even in the non-perturbative region.

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