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Electric conductivity and Baryon diffusion in hot hadronic matter from kinetic theory

Transport coefficients of hot hadron and QGP matter characterize their behavior upon external perturbations. Although this can be interesting by itself, they are important input for many phenomenological models that explain data for heavy-ion collisions. In this talk, we present our recent results from kinetic theory for the electric conductivity in a hot hadron gas (see Phys.Rev.D 93 (2016), 096012). The electric conductivity is recently gaining attention within several new studies about the possibly strong magnetic field influence in heavy-ion collisions. Our mostly analytic method includes 11 (or more) hadron species with their mutual parametrized (resonance) cross sections. It is based on the Boltzmann equation with a linearized collision term, which can be solved for the coefficients with in principle arbitrary precision. We extend the calculations to the baryon diffusion constant, baryon conductivity and heat flow. Below the phase transition, there is so far very little knowledge about these quantities, and kinetic theory serves as a unique quantitative tool which has a clear physical interpretation. Our results for zero chemical potential are contrasted to various strong coupling and lattice QCD results. Furthermore, results for finite chemical potentials can be obtained in the same framework. Baryon diffusion is a rather little explored but very important phenomenon in recent and future baryon-rich experiments, and our results could help to understand their data.

Preferred Track

QCD at High Temperature

Collaboration

Not applicable

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