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Calculation of anisotropic transport coefficients for a Boltzmann gas in strong magnetic field within a parton cascade

Summary

The existence of very large magnetic fields has been confirmed in relativistic heavy-ion collisions and the magnetic field will influence the fluid-dynamical evolution in these systems. Disipative magnetohydrodynamics show that the dissipative functions generally contain five shear viscosities, two bulk viscosities and three electrical conductivity coefficients. Employing the (3+1)-d parton cascade Boltzmann approach of multiparton scatterings (BAMPS), we calculate the anisotropic transport coefficients with the Kubo formulas for a massless Boltzmann gas in strong magnetic field. The presence of magnetic field can induce the oscillations of the corresponding correlation functions, which can lead to the change of their signs. The transport coefficients can also be obtained from 14-moment approximation. We find an good agreement between these two methods for the case of shear viscosities, which indicates the practicability that BAMPS can calculate the anisotropic transport coefficients for more realistic quark gluon matter. However, there exists discrepancy in the Kubo formulas for electric conductivities between some previous works. And our numerical results compared with 14-moment values may give a hint for solving the discrepancy.

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