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Quark Mass Effect and Transient Field Effect on Chiral Transport

Summary

As observables related to local parity violation, the chiral magnetic effect and chiral vortical effect in heavy ion collisions suffer from different background contamination[1-4]. This calls for a more realist theoretical calculation of the signal itself. We focus on two aspects on transport coefficients, one is quark mass effect and the other is transient electromagnetic field effect. The former is on axial chiral vortical effect and chiral separation effect at finite temperature and vector chemical potential[5]. The results indicate that the presence of mass generically suppresses the two coefficients, with less suppression at larger chemical potential. For phenomenologically relevant case of quark gluon plasma with three quark flavor, we find the correction is negligible. The latter is on frequency dependent electric conductivity in magnetized plasma, which is a key input for real time dynamics of chiral magnetic effect[6]. A strong and rapid decaying magnetic field due to noncentral collisions induces a rapid changing electric field. This requires the study in a more realistic regime[7]. We obtain the electric current from the Wigner transformation of Dirac equations in the Landau level basis with a constant background magnetic field and a transverse perturbative electric field.

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