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Chiral kinetic theory with Landau level basis

Summary

The chiral magnetic effect and chiral vortical effect enable us to probe possible local parity violation in hot dense matter created in heavy ion collisions. While equilibrium description is simple, the situation in heavy ion collisions can be quite far from equilibrium: the axial charge is likely to peak at early stage of the collisions [1-3], and the magnetic field and vorticity are also dominant at early stage. These require theoretical frameworks for out-of-equilibrium dynamics for chiral fermions. Chiral kinetic theory (CKT) offers such a framework. It has been derived based on field theory [4,5]. Previous works on CKT are organized as an expansion in \hbar , which is valid for weak magnetic field. Its simplicity is lost at second order [6]. We will present a CKT using Landau level as basis, which is valid for arbitrary magnetic field. In particular in strong magnetic field limit, it reduces to CKT in the lowest Landau level approximation [7].

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