

Chiral anomaly and local polarization effect from quantum kinetic approach

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Induced vector and axial vector currents are derived from solving the quantum kinetic equations for spin-1/2 charged fermions in a constant external field via a consistent iterative scheme. Chiral current anomaly $\partial_\mu j_5^\mu = CE \cdot B$, vector current conservation $\partial_\mu j^\mu = 0$ and the energy-momentum conservation $\partial_\mu T^{\mu\nu} = QF^{\nu\rho}j_\rho$ are all natural consequences of the solutions. This provides an independent derivation of the chiral anomaly from kinetic approach. The induced chiral current from vorticity is argued to lead to a local polarization effect along the vorticity direction in heavy ion collisions.

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