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Mass Correction to Chiral Kinetic Equations

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We study fermion mass correction to chiral kinetic equations in electromagnetic fields. Different from the chiral limit where fermion number density is the only independent distribution, the number and spin densities are coupled to each other for massive fermion systems. To the first order in ̄h, we derived the quantum correction to the classical on-shell condition and the Boltzmann-type transport equations. To the linear order in the fermion mass, the mass correction does not change the structure of the chiral kinetic equations and behaves like additional collision terms. While the mass correction exists already at classical level in general electromagnetic fields, it is only a first order quantum correction in the study of chiral magnetic effect.

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