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Non-Abelian Covariant Chiral Kinetic Equation

We derive the covariant chiral kinetic equation in a background of non-Abelian gauge field $SU(N)$ in the Wigner function formalism. We find that the color singlet phase-space distribution function and multiplet ones are totally coupled with each other.
These phase-space distribution functions have non-trivial Lorentz transformation rules when we define them in different reference frames.
The chiral anomaly from non-Abelian gauge field arises naturally from the vacuum contribution of the color singlet Wigner function.
The non-Abelian counterparts of chiral magnetic effect and chiral vortical effect have also been derived from the non-Abelian chiral kinetic equation.

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