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## Quantum kinetic theory for Dirac fermions in curved spacetime

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Many-body systems with chiral fermions exhibit anomalous transport phenomena originated from quantum anomalies. Based on quantum field theory, we derive the quantum kinetic theory for Dirac fermions interacting with an external electromagnetic field in a background curved geometry. The resultant framework is  $U(1)$  gauge invariant and local Lorentz and diffeomorphism covariant. In this talk, I will illustrate the gravitational or noninertial effects for Dirac fermions. We study the chiral dynamics in a rotating coordinate and clarify the roles of the Coriolis force and spin-vorticity coupling in generating the chiral vortical effect. We also show that the chiral vortical effect is an intrinsic phenomenon of a rotating chiral fluid, and thus independent of the observer's frame. The framework is also available for massive fermions. We derive the kinetic equation and spin evolution equation for massive fermions, and calculate the spin polarization induced by vorticity and magnetic field via kinetic theory.

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