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Kinetic theoretical formulation of relativistic spin-hydrodynamics

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Using the semi-classical formulation of kinetic theory, we obtain the evolution equations of the scalar and axial-vector components of the Wigner function of massive spin-half particles in the relaxation time approximation and construct the dissipative hydrodynamics to describe a spin-polarizable relativistic fluid. The relativistic Boltzmann equation is solved for the non-equilibrium corrections to the extended phase-space distribution function, which is then used for the non-equilibrium parts of the conserved currents of the system. We find the evolution of the spin tensor may depend on gradients of multiple hydrodynamic variables and thus conclude that an appropriate characterization of the spin-polarization phenomena, observed in relativistic heavy-ion collisions, may require a detailed description of multiple spin-transport coefficients [1,2].

[1] Bhadury, S. et. al. Phys.Lett.B 814 (2021) 136096.
[2] Bhadury, S. et. al. Phys.Rev.D 103 (2021) 1, 014030

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