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Spin Boltzmann equation and global polarization in HIC

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We derive Boltzmann equations for massive spin-1/2 fermions with local and nonlocal collision terms from the Kadanoff–Baym equation in the Schwinger–Keldysh formalism, properly accounting for the spin degrees of freedom. The Boltzmann equations are expressed in terms of matrix-valued spin distribution functions, which are the building blocks for the quasi-classical parts of the Wigner functions. Nonlocal collision terms appear at next-to-leading order in \hbar and are sources for the polarization part of the matrix-valued spin distribution functions. The Boltzmann equations for the matrix-valued spin distribution functions pave the way for simulating spin-transport processes involving spin-vorticity couplings from first principles.

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