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The Gilbert damping factor of heavy quark spin polarization in the magnetic field

In relativistic non-central heavy-ion collisions, both initial angular momentum and a strong magnetic field are generated, leading to the phenomenon of hadron spin polarization. In condensed matter physics, fermions can be spin polarized by the combined effects of spin-magnetic field and spin-orbit interactions. This phenomena has been extensively studied with the Landau-Lifshitz-Gilbert (LLG) equation. When studying the spin polarization of heavy quarks and quarkonium, the phenomenological LLG equation can be an effective approach. The Gilbert damping factor in LLG equation characterizes the spin polarization rate of fermions. In our study, we calculate the transverse susceptibility using linear response theory to express the Gilbert damping constant. We connect the spin polarization rate with the particle scattering cross sections in the medium. The spin polarization rate of heavy quarks are calculated with different potentials and temperatures.

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