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Evolution of global polarization in relativistic heavy-ion collisions within a perturbative approach

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Extremely large angular orbital momentum can be produced in non-central heavy-ion collisions,leading to a strong transverse polarization of partons that scatter through the QGP due to spin-orbital coupling.We develop a perturbative approach to describe the formation and spacetime evolution of quark polarization inside the QGP.Polarization from both the initial hard scatterings and interactions with the QGP have been consistently described using the quark-potential scattering approach,which has been coupled to realistic initial condition calculation and the subsequent (3+1)D viscous hydrodynamic simulation of the QGP for the first time.Within this improved approach,we have found that different spacetime-rapidity-dependent initial energy density distributions generate different time evolution profiles of the longitudinal flow velocity gradient,which further lead to an approximately 15% difference in the final polarization of quarks collected on the hadronization hypersurface of the QGP.

Theory / experiment

Theory

Group or collaboration name

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