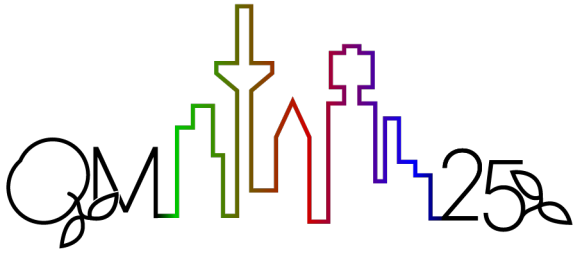

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Dilepton polarization as a signature of plasma anisotropy

Wednesday 9 April 2025 12:30 (20 minutes)

We propose the angular distribution of lepton pairs produced in ultrarelativistic heavy-ion collisions as a probe of thermalization of the quark-gluon plasma. We focus on dileptons with invariant masses large enough that they are produced through quark-antiquark annihilation in the early stages of the collision. The angular distribution of the lepton in the rest frame of the pair then reflects the angular distribution of quark momenta. At early times, the transverse pressure of the quark-gluon plasma is larger than its longitudinal pressure as a result of the fast longitudinal expansion, which results in an oblate lepton distribution. By contrast, direct (Drell-Yan) production by quarks and antiquarks from incoming nuclei, whose momenta are essentially longitudinal, results in a prolate distribution. As the invariant mass increases, Drell-Yan gradually becomes the dominant source of dilepton production, and the lepton distribution evolves from oblate to prolate. The invariant mass at which the transition occurs is highly sensitive to the equilibration time of the quark-gluon plasma or, equivalently, the shear viscosity over entropy ratio %\eta/s% in the early stages of the collision.

Category

Theory

Collaboration (if applicable)

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