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Spin polarization measurements in relativistic heavy-ion collisions

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The extreme temperatures and energy densities generated in the ultrarelativistic nuclear collisions produce a state of partonic matter, the quark-gluon plasma (QGP), which behaves almost like an ideal fluid. The created system may possess large orbital angular momentum leading to the global polarization of particles perpendicular to the reaction plane. Also, local asymmetries in the velocity fields due to anisotropic flow can generate vorticity and particle spin polarization along the beam direction. In parity-violating weak decays of hyperons, the momentum direction of the decay baryon is correlated with the hyperon spin. This feature can be used to measure the hyperon spin polarization and estimate the global and local vorticity of the system created in relativistic heavy-ion collisions. The spin polarization, being sensitive to the hydrothermal (flow velocity and temperature) gradients, is unique compared to conventional observables that are sensitive to the hydrothermal fields only. Hence, the recent measurements of global and local hyperon spin polarization at the Large Hadron Collider (CERN, Geneva) and Relativistic heavy ion collider (RHIC, USA) provides a unique opportunity to probe the QGP substructure with finer details.
This talk will present the recent experimental measurements of the hyperon spin polarization in heavy-ion collisions at the LHC and RHIC. The comparison of the measured global and local polarization with the hydrodynamic model calculations, including competing contributions from thermal and shear-induced vorticity will be discussed.

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