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Directed Flow Due to the Initial Source Tilt and Density Asymmetry in Cu+Au and Au+Au Collisions at STAR

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Despite of a generally very successful description of the elliptic and higher harmonic flow in heavy-ion collisions by theoretical models, there is no single model that explains the dependence of the directed flow on pseudorapidity, collision energy, system size, and the particle type. This indicates that an important piece in our picture of ultrarelativistic heavy-ion collisions is still missing. Directed flow is thought to arise from two main mechanisms: the so-called “tilted” source and the dipole-like initial density asymmetry. The asymmetric Cu+Au collisions provide a unique possibility to identify the roles of these two mechanisms.

We present the results of directed flow measurements for charged and identified particles in Cu+Au and Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV as a function of centrality, pseudorapidity, and transverse momentum. We show how the comparison of pseudorapidity dependence of v_1 and $\langle p_x \rangle$ can be used to quantify the contribution of different mechanisms of directed flow formation. We compare the results with Pb+Pb collisions at the LHC energies, and discuss the centrality and energy dependence of the relative contributions to the directed flow from the initial source tilt and from the density asymmetry.

Content type

Experiment

Collaboration

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