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Chiral magnetic effect search in p+Au, d+Au and Au+Au collisions at RHIC

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Content

Metastable domains of fluctuating topological charges can change the chirality of quarks and induce local parity violation in quantum chromodynamics. This can lead to observable charge separation along the direction of the strong magnetic field produced in relativistic heavy-ion collisions, a phenomenon called the chiral magnetic effect (CME). A major background source for CME measurements is the intrinsic particle correlations (such as resonances/jets decay) coupled with the azimuthal elliptical anisotropy v_2. In heavy-ion collisions, the magnetic field direction and event plane azimuthal angle Ψ_2 are correlated, thus the CME and the v_2-induced background are entangled. In small system p+Au and d+Au collisions, the Ψ_2 is mostly due to geometry fluctuations, and thus magnetic field direction and Ψ_2 are uncorrelated. The correlation measurements in small system collisions with respect to Ψ_2 are only sensitive to v_2-induced background while any CME is averaged to zero.

In this talk, we will present the STAR measurements of two-particle correlations with respect to Ψ_2 in p+Au, d+Au and Au+Au collisions at $\sqrt{s_{\rm NN}} = 200$ GeV. These results are analyzed as a function of particle multiplicity to shed light on the background contaminations of the CME measurements in heavy-ion collisions. We will also report results from a new analysis approach as a function of the particle pair invariant mass in order to suppress non-CME related physics backgrounds [1]. Data-model comparisons will also be shown wherever available.

[1] Jie Zhao, Hanlin Li, Fuqiang Wang, arXiv:1705.05410 [nucl-th].

Session

Collectivity in high energy collisions

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