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Collision-system dependence of charge separation relative to the second- and third-order event planes; Implications for the Chiral Magnetic Effect in STAR

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Validation of the Chiral Magnetic Effect (CME) in the quark-gluon plasma (QGP) produced in heavy-ion collisions can provide key insights into anomalous transport in QGP and the connections between chiral symmetry restoration, axial anomaly and gluonic topology. Recently, a charge-sensitive correlator, $R_m(S)$ [1], designed to discern between background- and CME-driven charge separation was used to carry out a detailed set of charge separation measurements, relative to both the 2nd- (Ψ_2) and 3rd-order (Ψ_3) event planes for several collision systems (A+A(B)). The measurements indicate nearly flat to convex $R_m(S)$ distributions for the measurements relative to Ψ_3 and those relative to Ψ_2 for the p(d)+Au systems, consistent with the essentially random \vec{B} -field orientations for these measurements. By contrast, the A+A measurements relative to Ψ_2 show concave-shaped $R_m(S)$ distributions suggestive of a CME-driven charge separation. Results for U+U collisions at $\sqrt{s_{NN}} = 193$ GeV and p(d)+Au, Cu+Au, Cu+Cu and Au+Au collisions at $\sqrt{s_{NN}} = 200$ GeV will be presented and discussed in this poster.

[1] N. Magdy, et al., Phys. Rev. C 97 (2018) 061901.

Primary author: ABDELRAHMAN, Niseem (University of Illinois at Chicago)

Presenter: ABDELRAHMAN, Niseem (University of Illinois at Chicago)

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