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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Will be presented by Niseem Magdy[1]

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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, $R_{\Psi_m}(\Delta S)$ [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 2^{nd}- (Ψ_2) and 3^{rd}-order (Ψ_3) event planes for several collision systems (A+A(B)). The measurements indicate nearly flat to convex $R_{\Psi_m}(\Delta S)$ 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 $R_{\Psi_2}(\Delta S)$ 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, S. Shi, J. Liao, N. Ajitanand, and R. A. Lacey, Phys. Rev. C 97, 061901 (2018)