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Checking Non-Flow Assumptions and Results via PHENIX Published Correlations in p+p, p+Au, d+Au, 3He+Au at 200 GeV

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Recently the PHENIX Collaboration has made available two-particle correlation Fourier coefficients for multiple detector combinations in minimum bias p+p and 0-5% central p+Au, d+Au, ^{3}He+Au collisions at 200 GeV (arXiv:2107.06634). Using these coefficients for three sets of two-particle correlations, azimuthal anisotropy coefficients v_2 and v_3 are extracted for midrapidity charged hadrons as a function of transverse momentum. As discussed in arXiv:2107.07287 and in this talk, we use the available coefficients to explore various non-flow hypotheses as well as compare the results with theoretical model calculations. The non-flow methods fail basic closure tests with AMPT and PYTHIA/ANGANTYR, particularly when including correlations with particles in the low multiplicity light-projectile going direction. In data, the non-flow adjusted v_2 results are modestly lower in p+Au and the adjusted v_3 results are more significantly higher in p+Au and d+Au. However, the resulting higher values for the ratio v_3/v_2 in p+Au at RHIC compared to p+Pb at the LHC is additional evidence for a significant over-correction. Incorporating these additional checks, the conclusion that these flow coefficients are dominated by initial geometry coupled with final-state interactions (e.g. hydrodynamic expansion of quark-gluon plasma) remains true, and explanations based on initial-state glasma are ruled out. The detailed balance between intrinsic and fluctuation-driven geometry and the exact role of weakly versus strongly-coupled pre-hydrodynamic evolution remains an open question for triangular flow, requiring further theoretical and experimental investigation.

Author: BELMONT, Ron (University of North Carolina at Greensboro)

Co-authors: NAGLE, James Lawrence (University of Colorado Boulder); SEIDLITZ, Blair Daniel (University of Colorado Boulder (US)); LIM, Sanghoon (Pusan National University (KR))

Presenter: BELMONT, Ron (University of North Carolina at Greensboro)

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