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Multiparticle correlations from direct calculation of cumulants using the particle azimuthal angles

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Multiparticle correlation techniques have been used to study the nature of long-range collectivity in small collision systems. The subevent cumulant method was shown to significantly reduce the nonflow contributions compared to the standard cumulant method. However, a jet could fall across the boundary between two neighboring subevents and residual nonflow exists in this method. Requiring an additional pseudorapidity gap between neighboring subevents could suppress the nonflow, but it reduces the statistical precision as the gap increases. In this work, We propose calculating the cumulants directly by looping over the particle azimuthal angles. This method is not possible for central and mid-central AA collisions due to the required computing resources, but is feasible for smaller collision systems and peripheral AA collisions. Multiparticle correlations are studied as a function of the pseudorapidity gap between each of the particles in all combinations. The method is tested with PYTHIA and AMPT, and demonstrates that a pseudorapidity gap of 0.8 between or larger successfully removes the nonflow correlations.

Primary authors: TUO, Shengquan (Vanderbilt University (US)); VELKOVSKA, Julia (Vanderbilt University (US))

Presenter: TUO, Shengquan (Vanderbilt University (US))

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