PHENIX RESULTS ON COLLECTIVE BEHAVIOR IN SMALL SYSTEMS

Julia Velkovska
(Vanderbilt University), on behalf of the PHENIX collaboration

The study of the quark-gluon plasma (QGP) relies on systems that have a large-enough volume in which thermal equilibrium can be achieved. It has long been believed that only collisions between heavy nuclei (AA) satisfy this condition. Extensive studies from RHIC and LHC have established that a near-perfect liquid is formed in AA collisions and this is considered one of the defining signatures of the QGP. However, recently a number of measurements from high-multiplicity collisions in small systems at LHC and RHIC have found strong correlations between the produced particles reminiscent of those observed in the AA collisions. A central question that arises is whether QGP is also formed in these small systems, which were previously considered to be control experiments. To study how the correlations emerge from the initial state of the collisions, the PHENIX experiment has performed a series of measurements in p+Au, d+Au, and He3+Au collisions at a nucleon-nucleon center-of-mass energy of 200 GeV. The Fourier harmonics of the azimuthal distributions of the produced particles are studied as a function of system size. The influence of the initial geometry is investigated. The results are compared to a variety oftheoreticalcalculations that invoke different mechanisms for producing final-state particle correlations. We will discuss opportunities for further studies of small system collectivity within the context of the RHIC d+Au beam energy scan program.