Contribution ID: **100** Type: **Oral presentation**

Observation of partonic flow in small collision systems with ALICE at the LHC

Wednesday, 6 April 2022 11:50 (20 minutes)

Over the last years, evidence of collective behavior has been observed in high-multiplicity collisions of small systems, however, its origin is not yet understood. In this talk, we will present the first measurement of ultra-long-range azimuthal angle correlations of identified particles in small collision systems by using forward detectors of ALICE, which allows the largest pseudorapidity separation of the particle correlations, $\Delta\eta \sim 5$, and significantly suppresses the non-flow contamination. We will show the p_{T}-differential flow, v_n, of identified hadrons with many different species, over a large p_{T} 0.2–8 GeV/c in both p–Pb and pp collisions. Strong evidence of splitting between the v_n of baryons and mesons is observed in the intermediate and high-p_{T} regions. Such behavior can be explained by the quark coalescence mechanism, pointing to the presence of the partonic collectivity in small systems. Furthermore, we extend measurements of the v_n of non-identified particles with the requirement of presence of hard probes such as jets or leading high-p_{T} particles in an event ("event-scale"dependence of v_n), as well as with the dependence of v_n over a wide rapidity range with the Forward Multiplicity Detector (up to $\Delta\eta \sim 8$) and compare results with models. To further constrain the properties of the partonic matter created in small systems, the measurement of nonlinear flow modes and the symmetric cumulants in pp, p–Pb, Xe–Xe and Pb–Pb collisions will be presented. The results are compared to a comprehensive collection of model calculations, including hydrodynamic and transport models. Finally, to investigate the origins of flow in small systems and pin down any potential contribution from initial momentum anisotropy that appears in the color glass condensate effective theory, the newly measured correlation between the mean transverse momentum and flow coefficients, $\rho(v_n^2, [p_{\mathrm{T}}])$, will be discussed. All the above measurements are based on the entire data taken from the LHC Run 2 by ALICE.

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Session Classification: Parallel Session T05: QGP in small and medium systems

Track Classification: QGP in small and medium systems