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Femtoscopy with identified charged pions in proton-lead collisions at $\sqrt{s_{\mathrm{NN}}}$=5.02 TeV with the ATLAS detector

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Bose-Einstein correlations between identified charged pions are measured for p+Pb collisions at $\sqrt{s_{\mathrm{NN}}}$=5.02 TeV with the ATLAS detector with a total integrated luminosity of 28 nb^{-1}. Pions are identified using ionization energy loss measured in the pixel detector. Two-particle correlation functions and the extracted three-dimensional source radii are presented as a function of average transverse pair momentum (k_{T}) and rapidity ($y*_{\pi\pi}$) as well as collision centrality. Pairs are selected with a rapidity $-2 < y^*_{\pi\pi} < 1$ and with an average transverse momentum 0.1<k_{T}<0.8 GeV. The effect on the two-particle correlation function from jet fragmentation is studied, and a new method for removing its contributions to the measured correlations is described. The measured homogeneity regions are substantially larger in more central collisions, and in central events the radii are observed to decrease with increasing pair k_{T}, which is understood as a signature of collective behavior. In order to relate the freeze-out geometry to particle flow, the radii are also presented as a function of azimuthal angle with respect to the second-order event plane. The amplitude of the azimuthal modulation is shown as a function of centrality and flow vector magnitude v_2. A correlation of the source size with the local multiplicity dN/dy^* is demonstrated.The scaling of the extracted radii with the mean number of participants is also used to compare a selection of initial-geometry models. The cross term R_{ol}, which couples the radial and longitudinal expansion of the source, is measured as a function of rapidity. A departure from zero is observed in the proton-going side with 4.8σ combined significance for the most central events.

Preferred Track

Correlations and Fluctuations

Collaboration

ATLAS

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