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Azimuthally differential pion femtoscopy relative to the second and third harmonic in Pb-Pb 2.76 TeV collisions from ALICE

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Azimuthally differential femtoscopic measurements, being sensitive to spatio-temporal characteristics of the source as well as to the collective velocity fields at freeze-out, provide very important information on the nature and dynamics of the system evolution. While the HBT radii modulations with respect to the second harmonic event plane reflect mostly the spatial geometry of the source, the third harmonic results are mostly defined by the system dynamics. Radii variations with respect to the third harmonic event plane unambiguously signal a collective expansion and anisotropy in the flow fields. Strong fluctuations in the initial geometry of the system lead to fluctuations in the anisotropic flow as well as the shape of the pion source at freeze-out. Event shape engineering (ESE) is a technique proposed to select events corresponding to a particular shape. Azimuthally differential HBT combined with ESE allows for a detailed analysis of the relation between initial geometry, anisotropic flow and the deformation of source shape.

In this talk, we present azimuthally differential pion femtoscopy with respect to second and third harmonic event planes as a function of the pion transverse momentum for different collision centralities. Our results on the dependence of the side-, out-, and long-radii on the pion emission angle with respect to the second harmonic event plane qualitatively agree with theoretical calculations, but the details show significant deviations. The final-state source eccentricity, estimated via side radius oscillations is found to be significantly smaller than the initial state source eccentricity. While the final-state source eccentricity for the second harmonic event plane remains positive in all centralities, the third harmonic event plane eccentricity becomes negative. All these results are compared to existing models. The effect of the selection of the events with high/low elliptic and/or triangular flow is also presented.

Preferred Track

Correlations and Fluctuations

Collaboration

ALICE

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