ID de Contribution: **69** Type: **Non spécifié**

Centrality dependence of Lévy-stable two-pion Bose-Einstein correlations in 200 GeV Au++Au collisions at PHENIX

lundi 4 novembre 2024 15:25 (25 minutes)

The PHENIX experiment measured the centrality dependence of two-pion Bose-Einstein correlation functions in $\sqrt{s_{NN}} = 200$ GeV Au
+
+Au collisions at the Relativistic Heavy Ion Collider at Brookhaven National Laboratory. The data are well represented by Lévy-stable source distributions. The extracted source parameters are the correlation-strength parameter λ
, the Lévy index of stability α, and the Lévy-scale parameter R as a function of transverse mass m_T and centrality. The $\lambda(m_T)$ parameter is constant at larger values of m_T, but decreases as m_T decreases. The Lévy scale parameter $R(m_T)$ decreases with m_T and exhibits proportionality to the length scale of the nuclear overlap region. The Lévy exponent m_T is independent of m_T within uncertainties in each investigated centrality bin, but shows a clear centrality dependence. At all centralities, the Lévy exponent α
is significantly different from that of Gaussian ($\alpha = 2$) or Cauchy ($\alpha = 1$) source distributions. Comparisons to the predictions of Monte-Carlo simulations of resonance-decay chains show that in all but the most peripheral centrality class (50\%-60\%), the obtained results are inconsistent with the measurements, unless a significant reduction of the in-medium mass of the η' meson is included. In each centrality class, the best value of the in-medium η' mass is compared to the mass of the η
meson, as well as to several theoretical predictions that consider restoration of $U_A(1)$ symmetry in hot hadronic matter.

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