Multi-dimensional investigation of the pion pair-source in heavy-ion collisions with EPOS

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Theoretical framework and methods

- EPOS: event generator of heavy-ion collisions
- Event-by-event and 3 dimensional investigation to see if the Lévy shape is the result of event-averaging or direction averaging
- Pion pair source function fitted with Lévy distribution
  \[ D(r) = \mathcal{L} \left( r, 2^{\frac{1}{\alpha}} R_{\text{out}}, 2^{\frac{1}{\alpha}} R_{\text{side}}, 2^{\frac{1}{\alpha}} R_{\text{long}}, \alpha \right) \]
- Event-by-event distributions of pion pairs
- Separated the measurements into centrality and \( k_T \) classes
- 3 dimensional pair-distribution \( \Rightarrow \) 1 dimensional projections according Bertsch-Pratt-coordinates \( \Rightarrow \) fitting 1 dimensional Lévy-functions to the projections
  \[ \mathcal{L}(r, R_{\text{out,side,long}}, \alpha) = \frac{1}{\pi} \int_{0}^{\infty} dq \cos qr e^{-\frac{1}{2} q R_{\text{out,side,long}}} \]
- For the 3 projection of a 3 D distribution: fitting simultaneously with same Lévy exponent but different Lévy scales
Results

➢ Lévy-exponent: $\alpha \approx 1.6 - 1.7$, not Gaussian ($\alpha \neq 2$)
➢ Lévy-scale: different values for the different projections (with the same $\alpha$-s)
➢ Lévy shape is not the result of event-averaging or direction averaging
➢ Results agree with 1D analysis of Ref. D. Kincses, M. Stefaniak and M. Csanád, Entropy 24 (2022) no.3, 308

Mean $R$ values vs. $kt$

Mean $\alpha$ values vs. $kt$

Thank you for your attention!