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

$$\mathrm{D}(r) = \mathcal{L}\left(r, 2^{\frac{1}{\alpha}}R_{out}, 2^{\frac{1}{\alpha}}R_{side}, 2^{\frac{1}{\alpha}}R_{long}, \alpha\right)$$

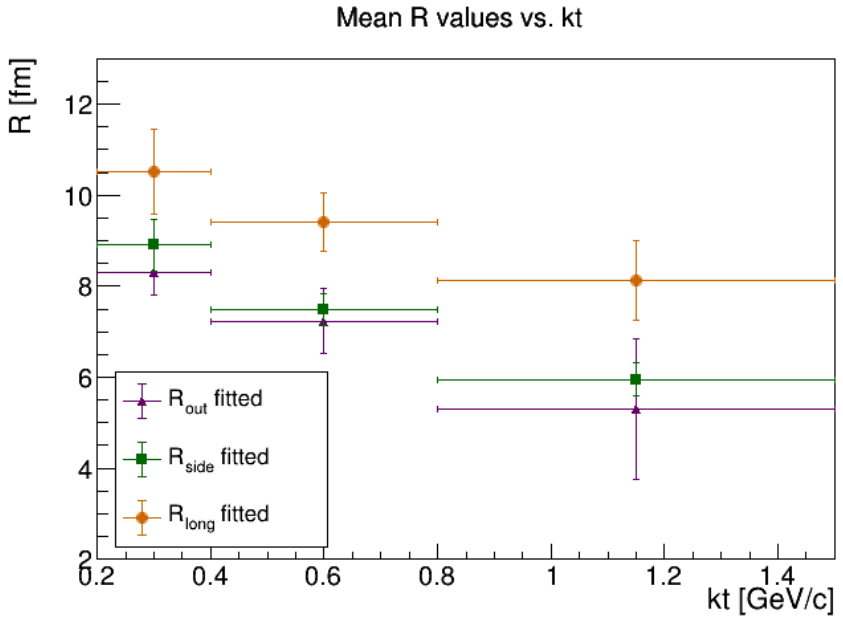
- Event-by-event distributions of pion pairs
- Separated the measurements into centrality and k_T classes
- 3 dimensional pair-distribution ⇒ 1 dimensional projections according Bertsch-Pratt-coordinates ⇒ fitting 1 dimensional Lévy-functions to the projections

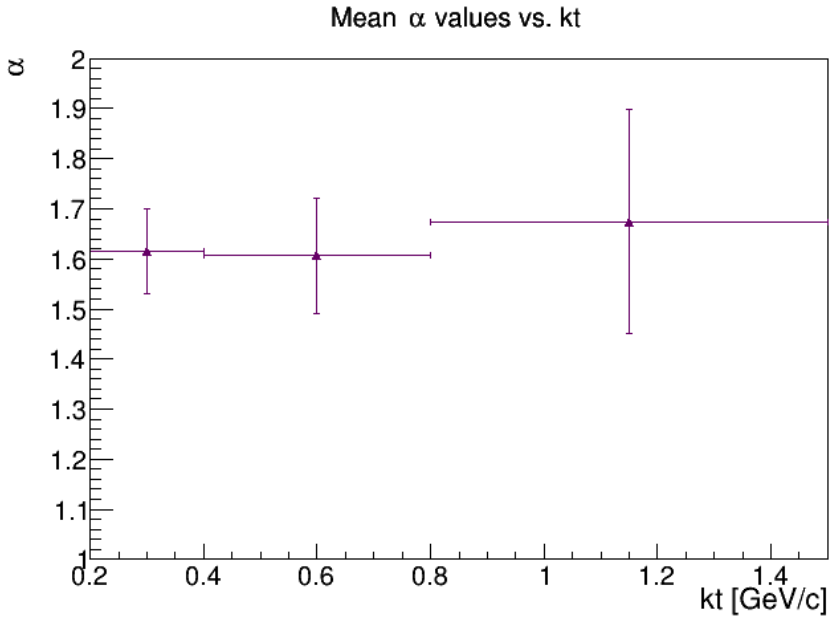
$$\mathcal{L}\left(r, R_{out,side,long}, \alpha\right) = \frac{1}{\pi}\int_0^\infty dq \cos qr \, e^{-\frac{1}{2}qR_{out,side,long}}$$

- 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 α-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





Thank you for your attention!