Centrality dependence of $\pi^-\pi^-\text{BE}$ correlations at 158 AGeV

(status report)

Christopher Alt
Outline

• Why do we analyse centrality dependence?
• About the analysis
• Our preliminary results
• Comparison
• Outlook
Why do we analyse centrality dependence?

In a naive picture of a heavy ion collision the spatial size of the particle emitting source should increase with decreasing impact parameter.

This behaviour should be seen in the dependence of HBT Radii on centrality.

If we assume the volume of the source to be described by

\[ V_f = (2\pi)^{3/2} R_{\text{long}} R_{\text{side}}^2 \]

we should see a monotonic increase with centrality.
About the analysis

- Data: 158 A GeV minimum bias:
  00M (256 000 events), 00N (150 000 events), 01J (340 000 events)
- Analyzed bins:
  - Pair rapidity: \(2.9 < Y_p < 3.4\)
  - Pair transverse momentum: \(0.1 < k_t < 0.2\) GeV / c
- Cuts
  - Track cuts: Charge = −1
    DedxSigma(0.9, 1.1) (Pb+Pb, Pions)
    Minimum number of Points = 30 (global)
    Minimum ratio \(N_{\text{points}}/N_{\text{pot. points}} = 0.5\) (global)
    \(|B_x| < 3\) cm, \(|B_y| < 1\) cm
    \(\chi^2 < 20\)
  - Pair cuts: minimum two track distance: 2 .. 4 cm
- Bertsch–Pratt parametrisation in LCMS
  \[ C(q) = 1 + \lambda \exp(-R^2_{\text{side}} q^2_{\text{side}} - R^2_{\text{out}} q^2_{\text{out}} - R^2_{\text{long}} q^2_{\text{long}} - 2R^2_{\text{outlong}} q_{\text{out}} q_{\text{long}}) \]
- Coulomb correction (background):
  \(r_{\text{Coul}} = 20\) fm
Two track cut

• Loss of pairs in signal due to finite track separation

- Criterion for setting the two track cut:
  \[ \frac{\text{Signal}}{\text{Background}} \approx 1 \]

- two track cut varies from 4 cm (most central) to 2 cm (most peripheral)
Coulomb correction

- less pairs with small $q_{inv}$ in signal due to coulomb repulsion
- each pair in the background is weighted with a number depending on $q_{inv}$ (Sinyukov)
Centrality classification:

The events are sorted by their veto energy into 6 bins of centrality.
Our preliminary results

- Decreases with decreasing centrality
- Large errors for central events
- Unexpected behaviour at most central bin
most central events

Shows a monotonic increase with increasing centrality

unexpected behaviour at most central bin not observed
Weak centrality dependence

→ Errors of the second bin very large

← most central events

\( R_{\text{long}} \) vs Centrality

- Uncorrected
- Coulomb corrected

Centrality vs R_{\text{long}} [fm]
Comparison

Previous NA49 results (QM02)

- Different binning for the most central bins
- Smaller for the most peripheral bins
- Larger for the most central bins
- Unexpected behaviour at most central bin not observed
Both show a monotonic increase

→ New curve: lower at low and higher at high centralities

→ Seems to be steeper
Old curve almost constant
Both curves show a monotonic increase

New curve: Problem at high centralities ($R_{side}$)
Outlook

- optimisation of cuts
- estimation of the systematic errors
- $k_t$ –dependence
- analysis of 40 A GeV minimum bias