Motivation for K-+K-ch HBT Measurements

- Two-particle correlations at low relative momentum provide information on the space-time geometry of emitting sources on the femtoscopic scale.
- Dynamical properties of the system are reflected in the total pair momentum dependence of the correlations.
- Charged kaons have a smaller contamination than pions from resonance decays.
- Study the dependence of the emission source on event multiplicity and higher pair transverse momentum region.
- Study the evolution of the system with the incident energy.

Simulation and Fitting Procedures

- A standard parametrization is obtained by assuming gaussian space-time distribution:
  \[ C_2(Q) = N(1 - \lambda + \lambda K(Q)e^{-R^2Q^2})B(Q) \]
  where \( N \) – normalization factor, \( \lambda \) – correlation strength, \( K(Q) \) – Coulomb function integrated over a spherical source of 1 fm and \( B(Q) \) – baseline function, that takes into account non-femtoscopic correlations, e.g. energy and momentum conservation induced correlations [1].

- In order to take into account non-femtoscopic correlations Monte Carlo generator PYTHIA-6.4.27 [2] with Perugia 2010 Tune [3] was used.

The Source Radii Dependence on the Event Multiplicity

- In order to reduce non-femtoscopic correlations the experimentally measured correlation functions are corrected with the simulated correlation functions.
- The study of the femtoscopic radii dependence on the event multiplicity reflects the geometrical property of the underlying event [4].

Charged Particle Identification

- Time Projection Chamber:
  - Charged particle tracking and momentum reconstruction.
  - 2π azimuthal coverage.
  - Pseudorapidity \(-1.3 < \eta < 1.3\).
  - Particle identification via specific ionization energy loss \( dE/dx \).

- Time of Flight:
  - Particle identification via \( 1/\beta \).
  - Timing resolution < 100 ps.
  - Allows to separate charged kaons from other particle species in a wide momentum range up to 1.5 GeV/c.

The kT Dependence of the Emission Source

- Correlation functions were constructed for both \( \sqrt{s} = 200 \) and \( \sqrt{s} = 510 \) GeV energies; four \( k_T \) bins: \((0.1-0.25), (0.25-0.35), (0.35-0.5), (0.5-1) \) GeV/c; two multiplicity ranges: Mult<9, Mult\geq9; compared and corrected with the simulated correlation functions.
- The source radii decrease with pair transverse momentum for both incident energies and compared to the data measured by ALICE at \( \sqrt{s} = 7 \) TeV [5].

Summary:

- Charged kaon correlations at low relative momentum measured in STAR at \( \sqrt{s} = 200 \) and \( \sqrt{s} = 510 \) GeV, four transverse momentum and two multiplicity ranges.
- The source radii increase with the event multiplicity for both incident energies that shows the geometrical property of the underlying event.
- The extracted source radii for two multiplicity and four pair transverse momentum ranges slightly decrease with \( k_T \) for both multiplicities that may reflect bulk collective flow.

References: