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Charged kaon Bose-Einstein correlations in p+p collisions at STAR

G. Nigmatkulov (for the STAR collaboration)

National Research Nuclear University MEPhI
(Moscow Engineering Physics Institute)

Outline

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- The STAR experiment at RHIC
- Fitting procedures
- Data selection
- Event multiplicity and energy dependencies
- Transverse momentum dependency
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Motivations

- Study the space-time geometry of the emitting sources on femtoscopic scale in hadronic collisions
- Contamination from the resonance decays is smaller for charged kaons than for pions
- Study the evolution of the system with the incident energy
- Study the multiplicity and pair transverse momentum dependencies of the source radii

Fitting procedures

- Correlation functions were fitted by a standard parameterization assuming the gaussian space-time distribution:

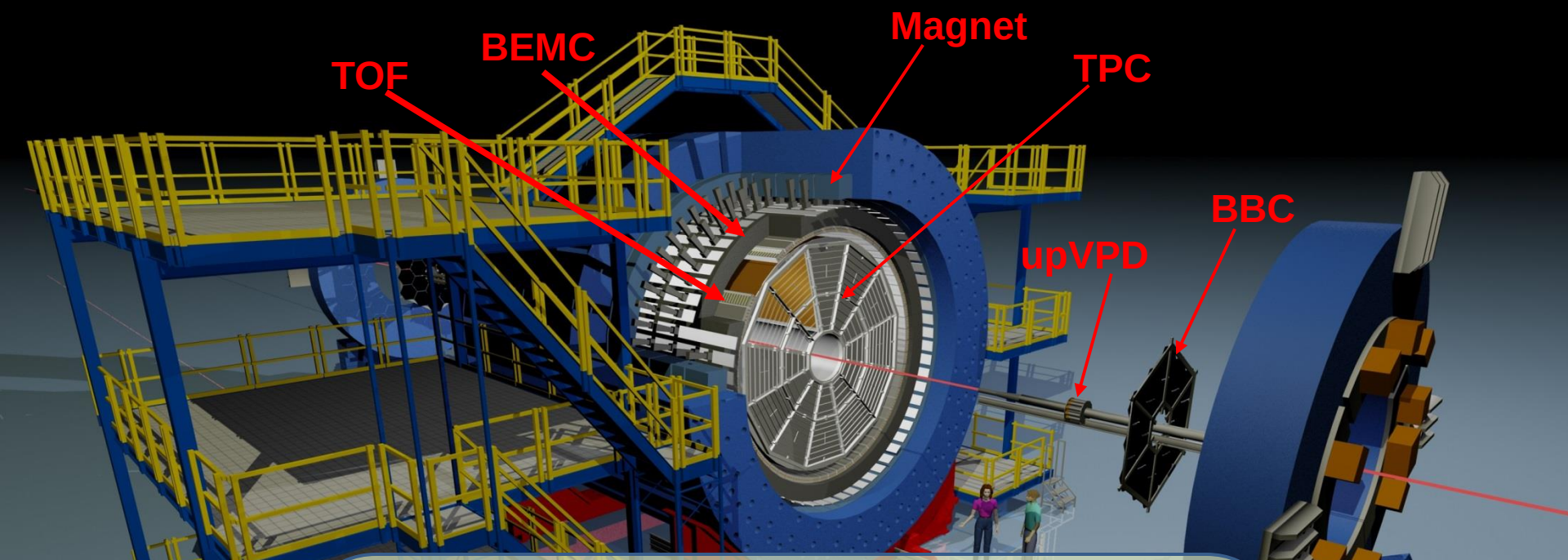
$$C_2(Q) = N\left(1 - \lambda + \lambda K(Q) e^{-R^2 Q^2}\right) B(Q)$$

  - N – normalization factor
  - λ – correlation strength
  - *K(Q)* – Coulomb function integrated over a spherical source of 1 fm
  - *B(Q)* – baseline function, that takes into account non-femtoscopic correlations

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

T. Sjostrand, S. Mrenna, P. Z. Skands, JHEP 05:026, 2006
P. Z. Skands, Phys. Rev. D 82:074018, 2010

The Solenoidal Tracker At RHIC (STAR)



Time Projection Chamber (TPC)

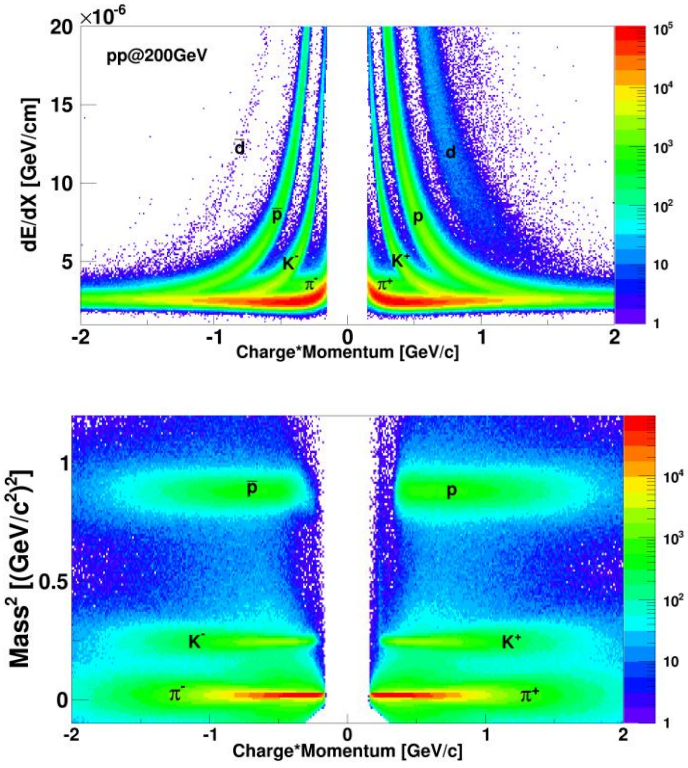
- Charged particle tracking and momentum reconstruction
- 2π azimuthal coverage
- $|\eta|<1$
- Particle identification via specific ionization energy loss dE/dx

Time of Flight (TOF)

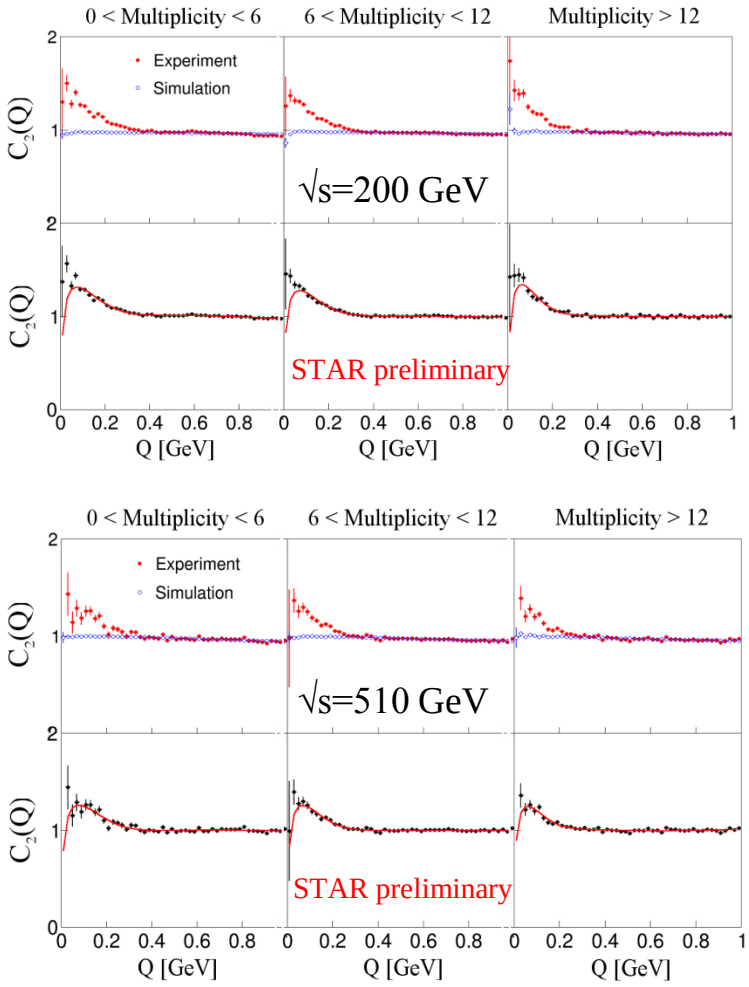
- Particle identification via $1/\beta$
- Timing resolution < 100 ps
- Allows to separate charged kaons from pions in a wide momentum range up to 1.6 GeV/c

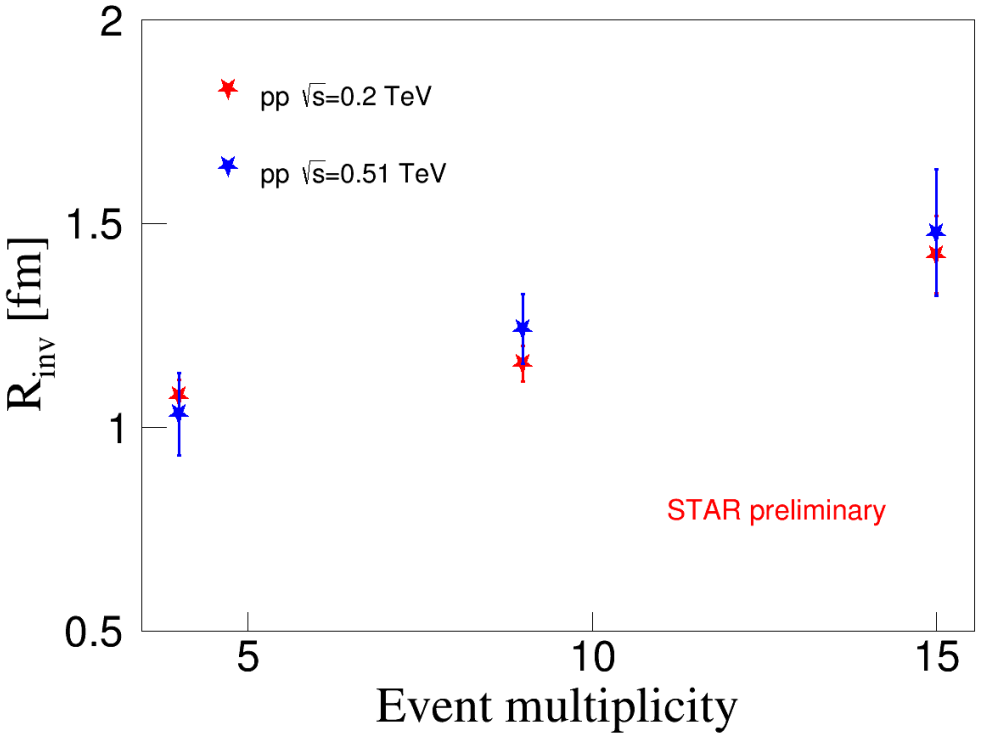
Data selection

- pp collisions at $\sqrt{s}$=200 and $\sqrt{s}$=510 GeV
- Primary tracks with $|\eta|<1$
- TPC:
  - If no TOF signal
  - $|n\sigma(K)|<2$
  - $p \in [0.15; 0.55]$ GeV/c
- TOF:
  - $m^2 \in [0.2; 0.35]$ $(GeV/c^2)^2$
  - $p \in [0.15; 1.55]$ GeV/c
- Fraction of merged rows < 10%



Event multiplicity and energy dependencies

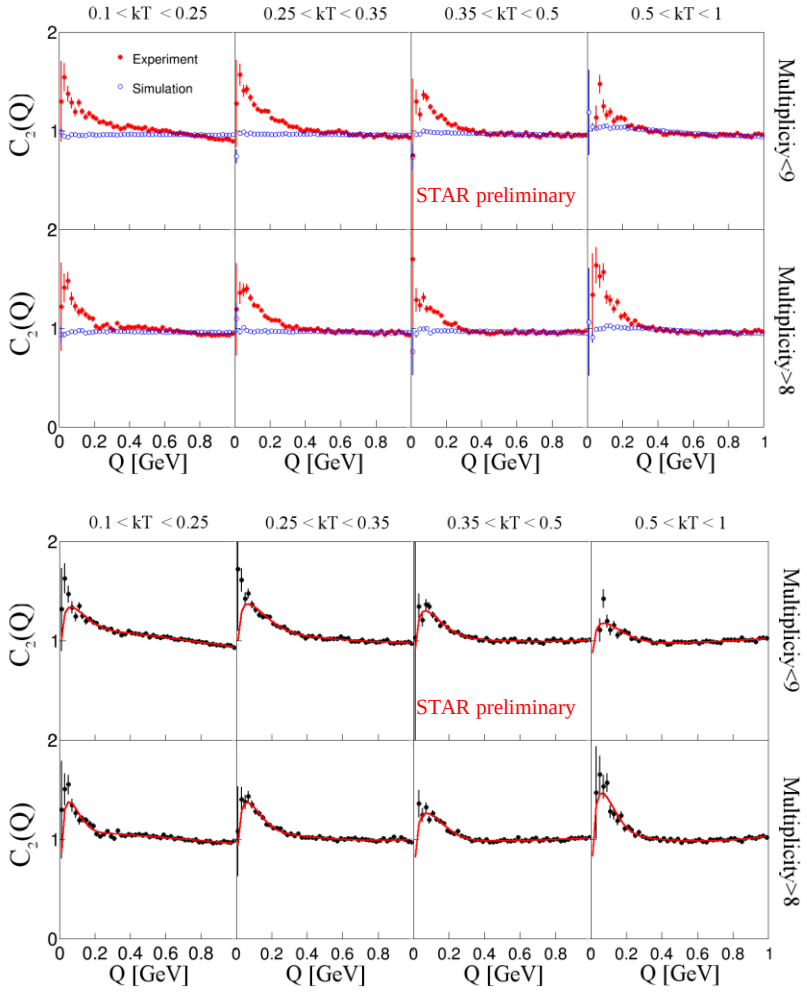




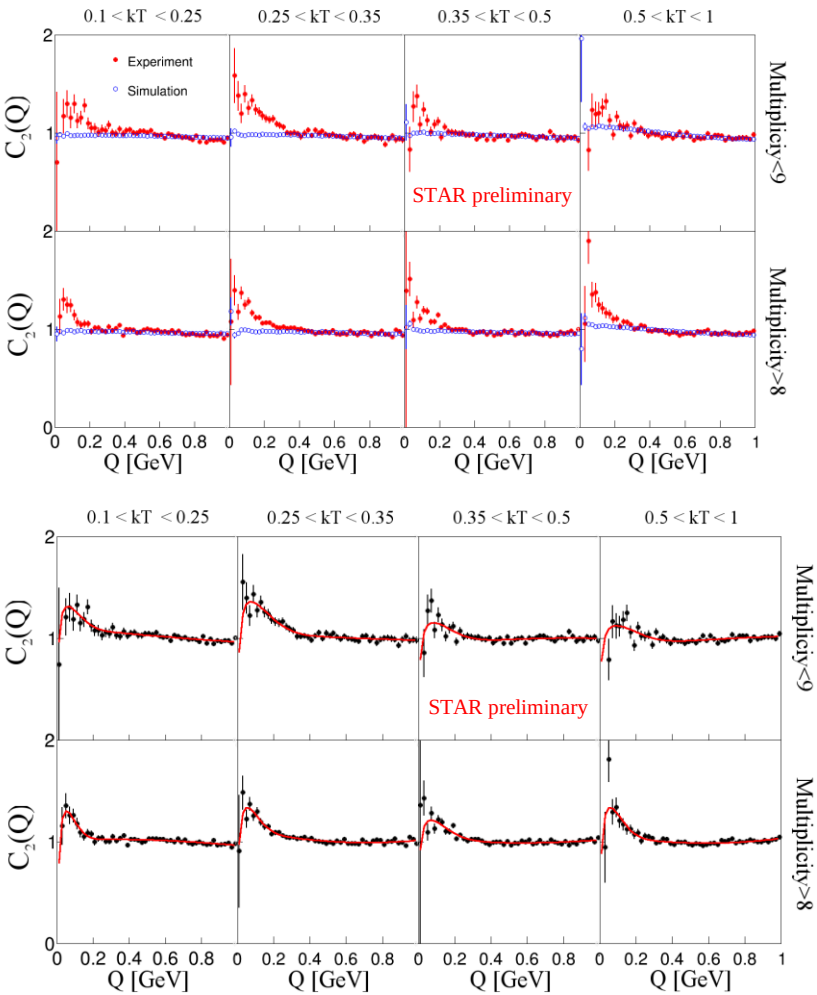
The source radius weakly (does not?) depends on the collision energy and increases with event multiplicity

Study the dynamical properties of the emitting source

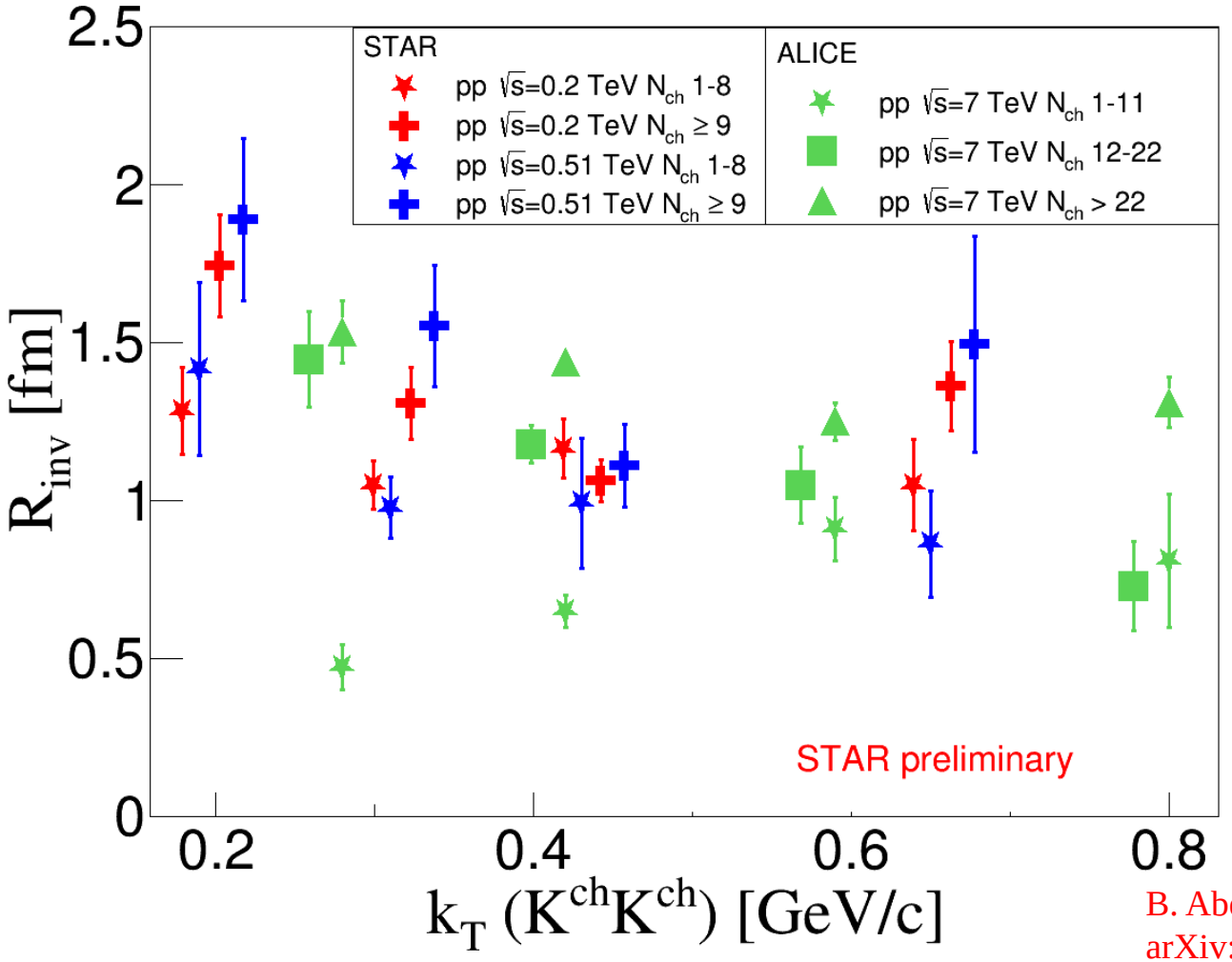
√s=200 GeV



√s=510 GeV



Study the dynamical properties of the emitting source



The source radii decrease with pair transverse momentum for both event multiplicities. Small difference in the measured emitting source radii between RHIC and LHC energies.

B. Abelev et al, (The ALICE collaboration), arXiv:1212.5958 [hep-ex]

Summary

- The emitting source radii increase with event multiplicity and weakly depend from on the incident energies

- The extracted source radii for two multiplicity and four pair transverse momentum ranges slightly decrease with k_T for both multiplicities and incident energies that may reflect bulk collective flow