



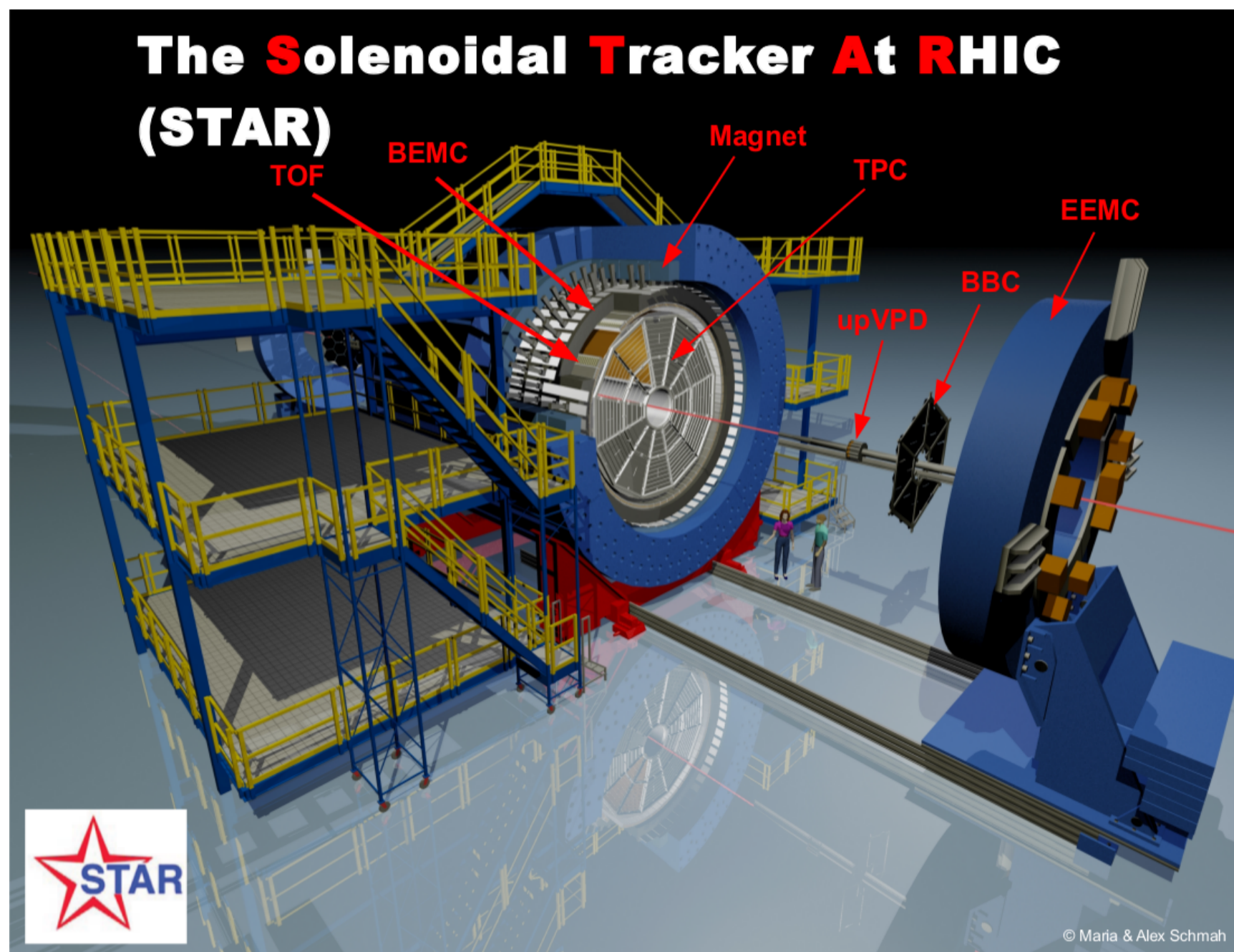
Femtoscopic analysis of charged kaon correlations at small relative momentum in $p+p$ collisions in STAR



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Motivation for $K^{\text{ch}}K^{\text{ch}}$ HBT Measurements

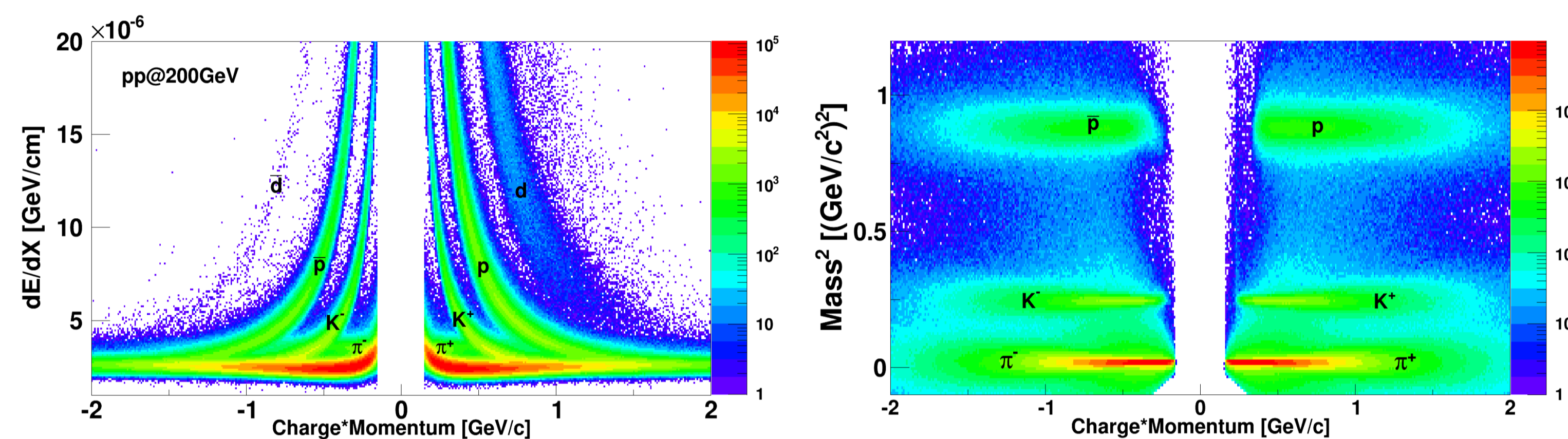
- Two-particle correlations at low relative momentum provide information on the space-time geometry of emitting sources on the femtoscopic scale. Dynamical properties of the system are reflected in the total pair momentum dependence of the correlations
- Charged kaons have a smaller contamination than 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



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



Simulation and Fitting Procedures

- A standard parametrization is obtained by assuming gaussian space-time distribution:

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

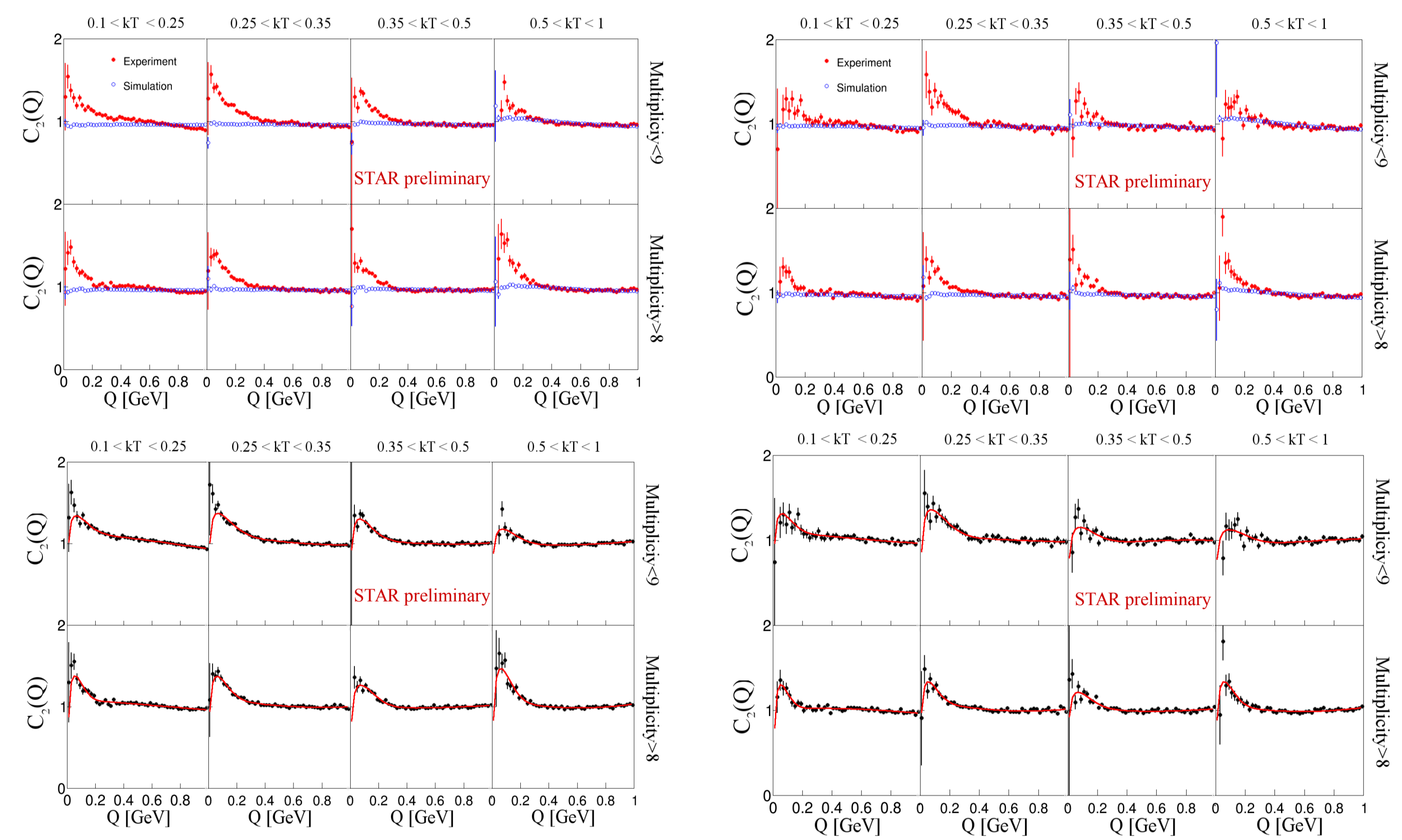
where N – normalization factor, λ – correlation strength, $K(Q)$ – Coulomb function integrated over a spherical source of 1 fm and $B(Q)$ – baseline function, that takes into account non-femtoscopic correlations, e.g. energy and momentum conservation induced correlations [1]

- 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 k_T Dependence of the Emission Source

$\sqrt{s} = 200$ GeV

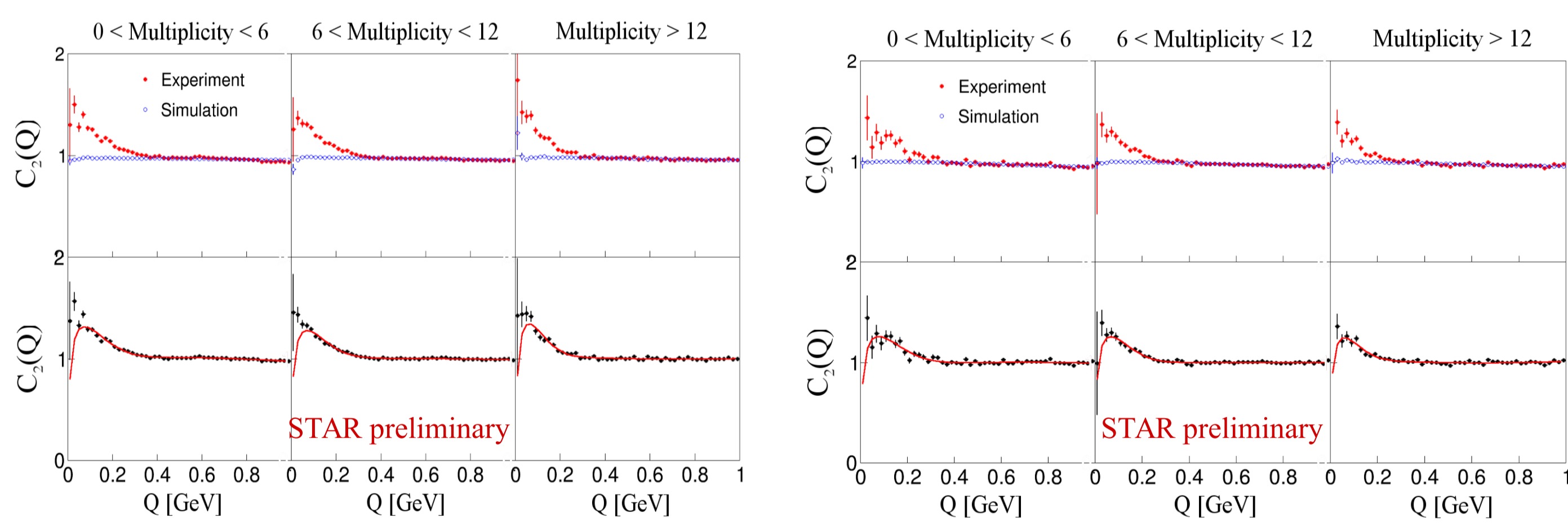
$\sqrt{s} = 510$ GeV



The Source Radii Dependence on the Event Multiplicity

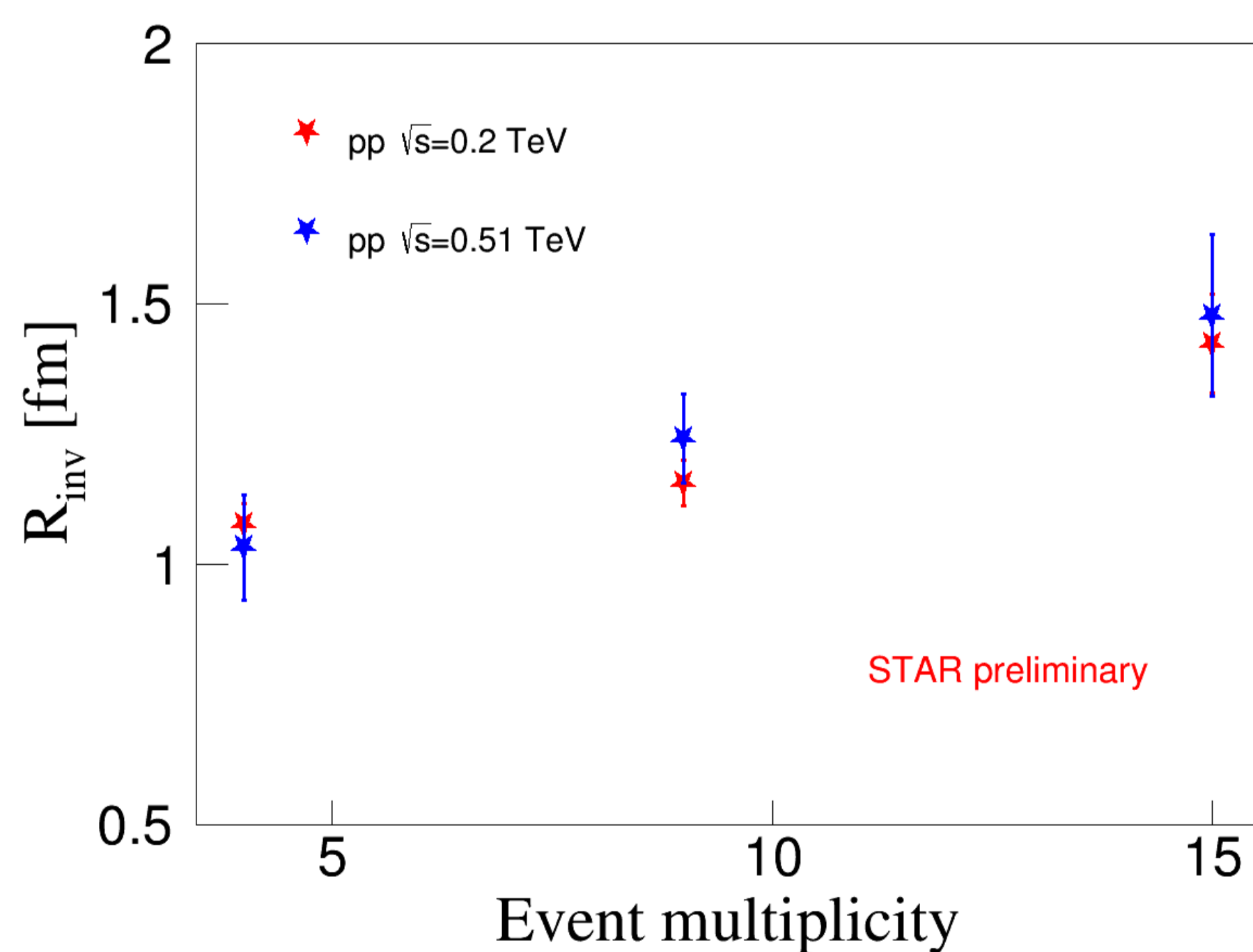
$\sqrt{s} = 200$ GeV

$\sqrt{s} = 510$ GeV

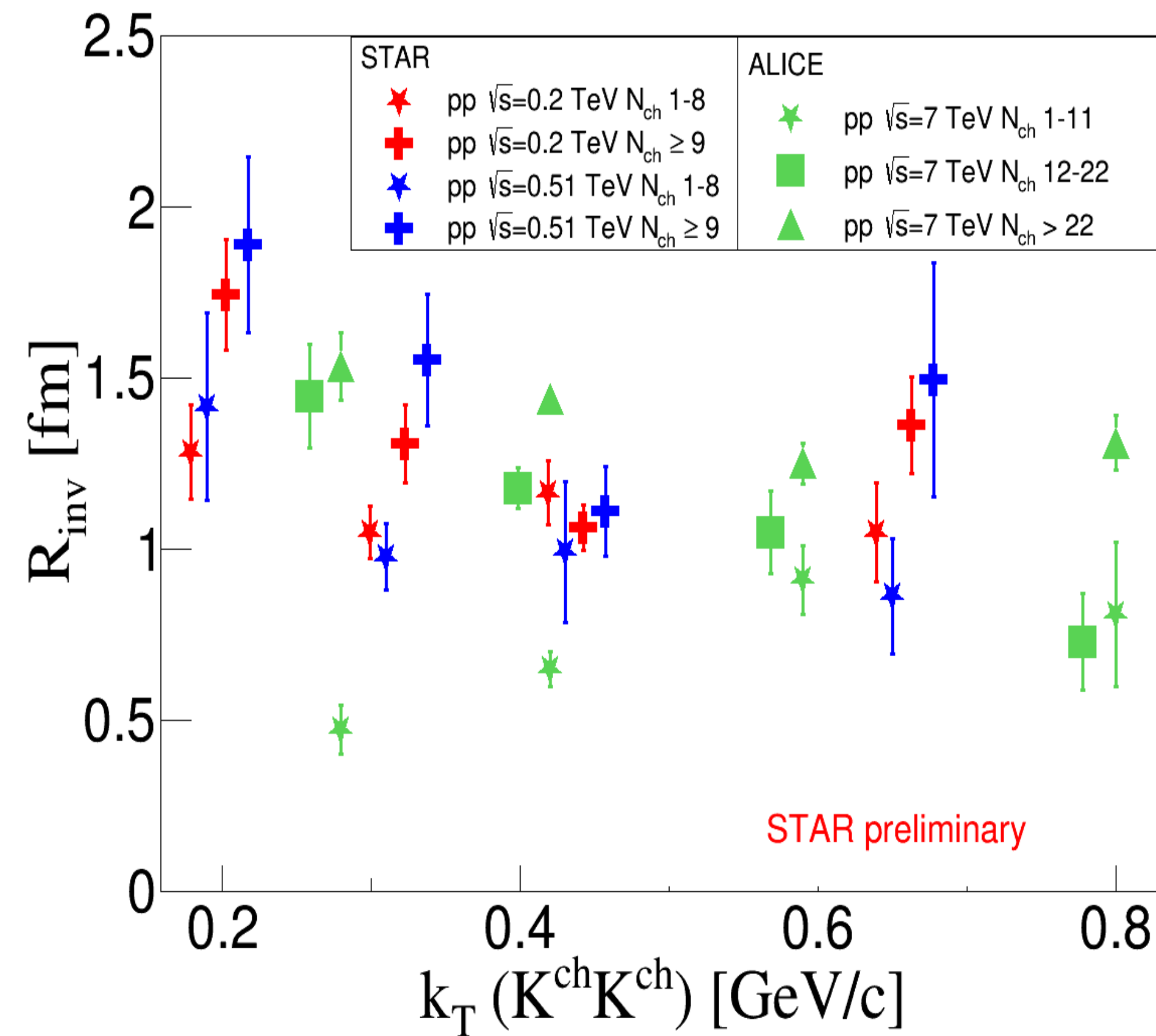


- In order to reduce non-femtoscopic correlations the experimentally measured correlation functions are corrected with the simulated correlation functions

- The study of the femtoscopic radii dependence on the event multiplicity reflects the geometrical property of the underlying event [4]



- 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 \geq 9; 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]

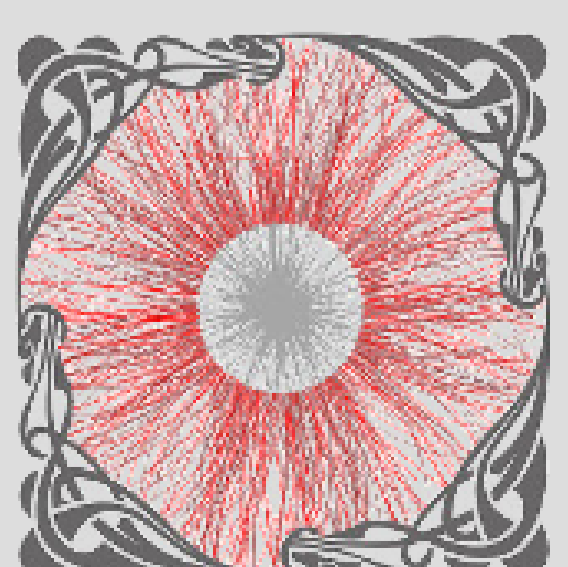


Summary:

- 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:

- [1] Z. Chajecski, M. Lisa, Phys. Rev. C 78:064903, 2008
- [2] T. Sjostrand, S. Mrenna, P. Z. Skands, JHEP 05:026, 2006
- [3] P. Z. Skands, Phys. Rev. D 82:074018, 2010
- [4] M. Lisa, S. Pratt, R. Soltz, U. Wiedemann, Ann. Rev. Nucl. Part. Sci. 55:357-402, 2005
- [5] B. Abelev et al. (The ALICE Collaboration), arXiv:1212.5958 [hep-ex]



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