



# Bose-Einstein correlations of charged kaons in p+p collisions measured with the STAR detector

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Strangeness in Quark Matter  
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- Introduction and motivations
- Detector layout
- Multiplicity dependence
- Multiplicity and  $k_T$  dependencies
- Summary

- Femtoscopy with **strange** particles
- Cleaner probe of the emitting source due to the **smaller contamination** from the resonance decays compared with pions
- Kaon scattering cross-sections are generally smaller than those for pions, hence kaons may provide information about a **different stage of the collision evolution**
- Study the evolution of the system with the **colliding energy**

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

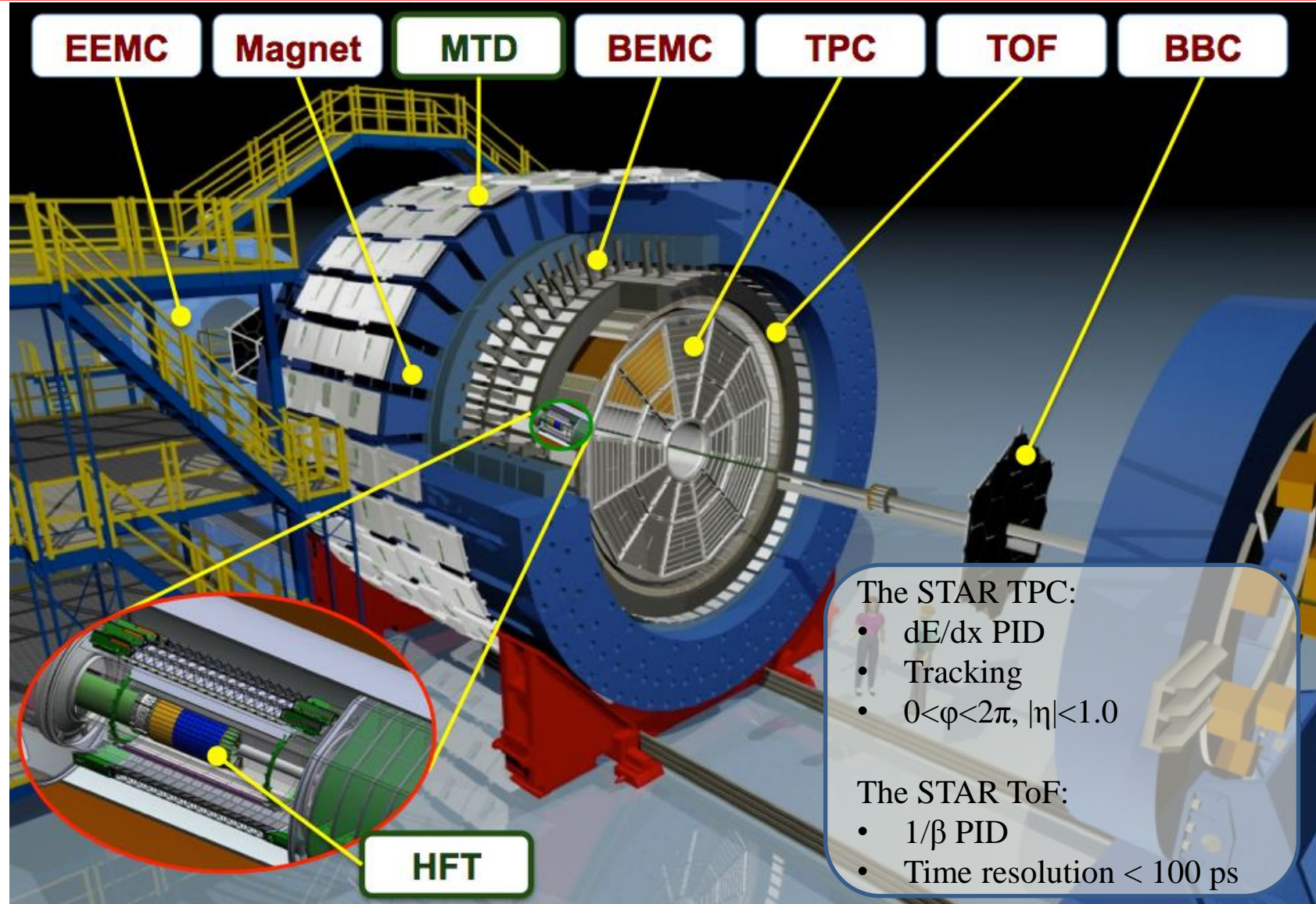
$$C_2(Q_{inv}) = N \left( 1 - \lambda + \lambda K(Q_{inv}) e^{-R^2 Q_{inv}^2} \right) B(Q_{inv})$$

- N – normalization factor
  - $\lambda$  – correlation strength
  - $K(Q_{inv})$  – Coulomb function integrated over a spherical source of 1 fm
  - $B(Q_{inv})$  – baseline function, that takes into account non-femtoscopic correlations
- In order to take into account non-femtoscopic correlations Monte Carlo generator PYTHIA-6.4.28 with Perugia 0 Tune was used

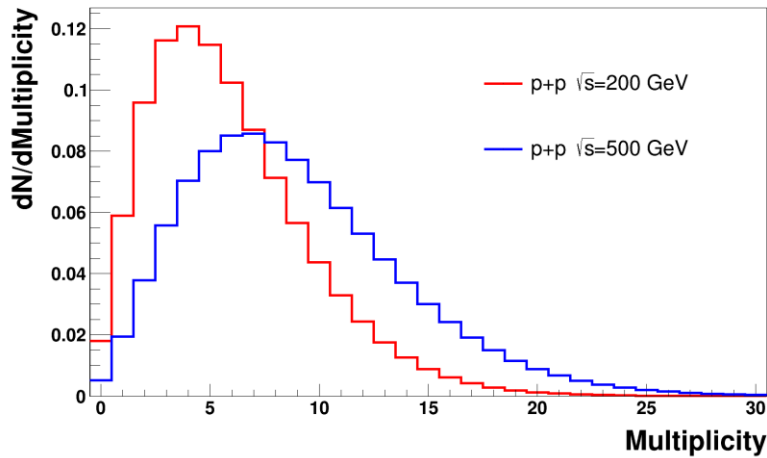
T. Sjostrand, S. Mrenna, P. Z. Skands, JHEP 05:026, 2006

P. Z. Skands, Phys. Rev. D 82:074018, 2010

# Solenoidal Tracker At RHIC

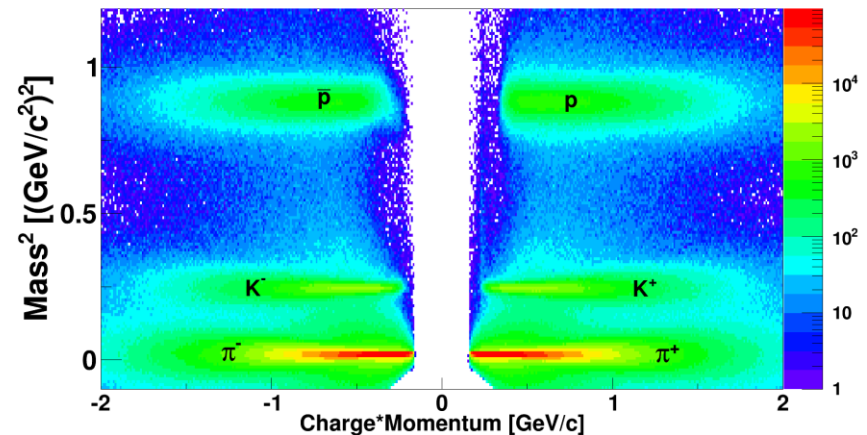
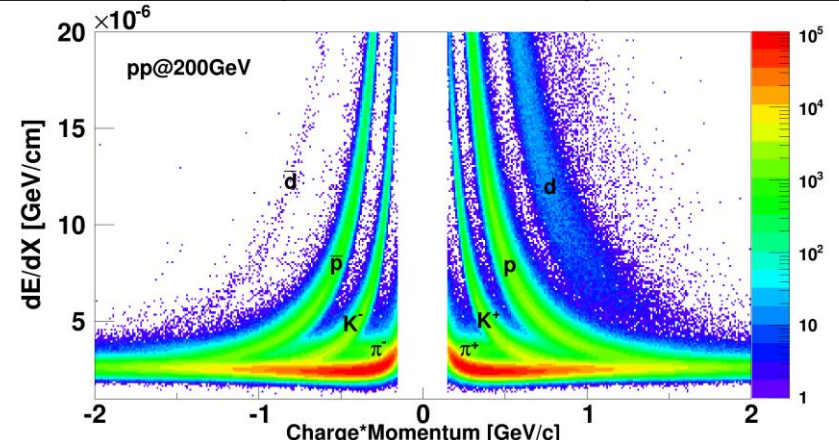


# Selection criteria

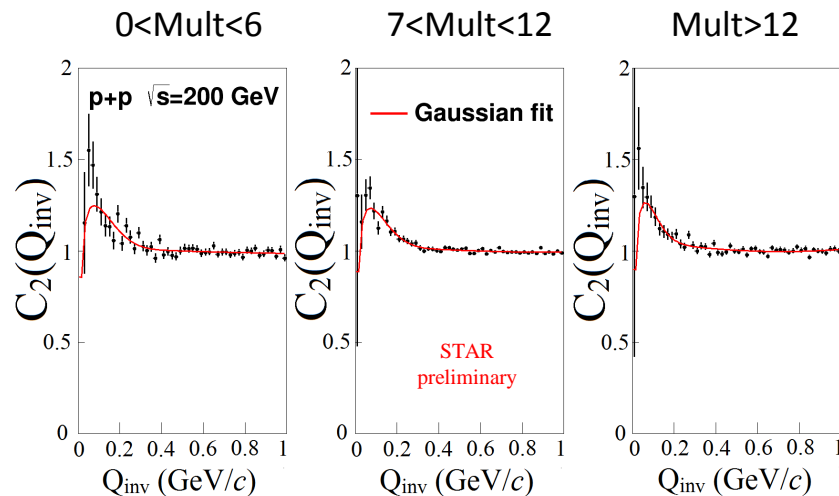
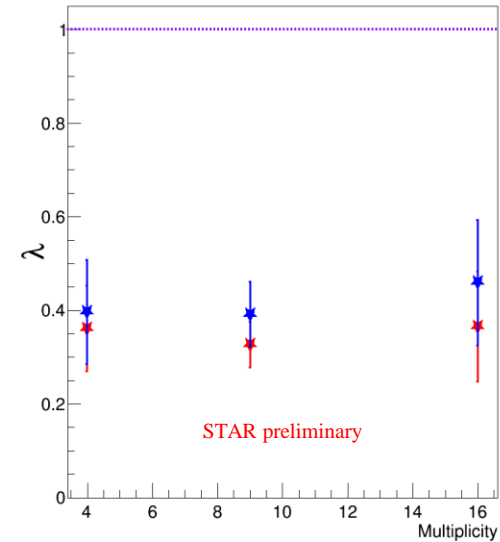
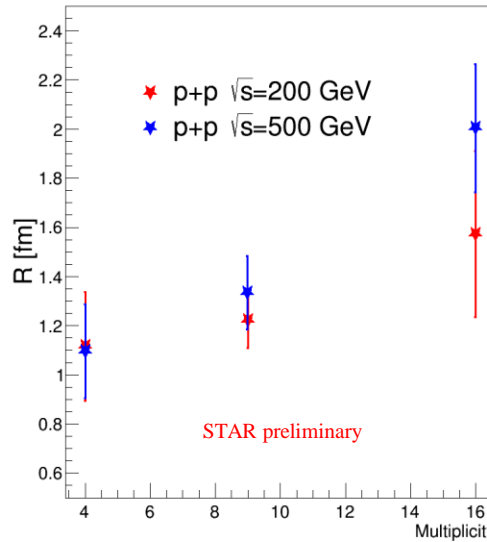
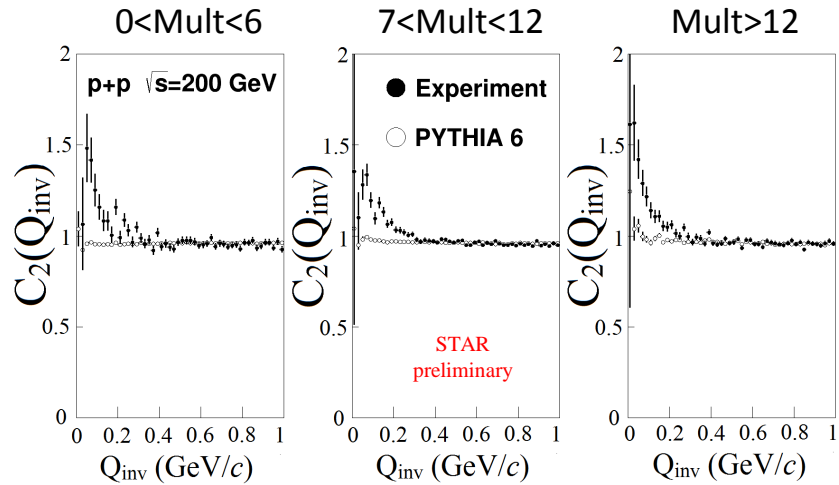


p+p collisions		
Energy (GeV)	200	500
# of events	589M	61M

- TPC
  - $|\text{nc}(K)| < 2$  and  $|\text{nc}(\text{other})| > 2$
  - $0.15 < p < 0.55$  GeV/c
  - Nhits > 15
- ToF
  - $0.2 < m^2 < 0.35$  (GeV/c<sup>2</sup>)<sup>2</sup>
  - $0.15 < p < 1.55$  GeV/c
- Track merging < 10%
- $-0.5 < \text{Track splitting} < 0.6$
- Average track separation > 5cm



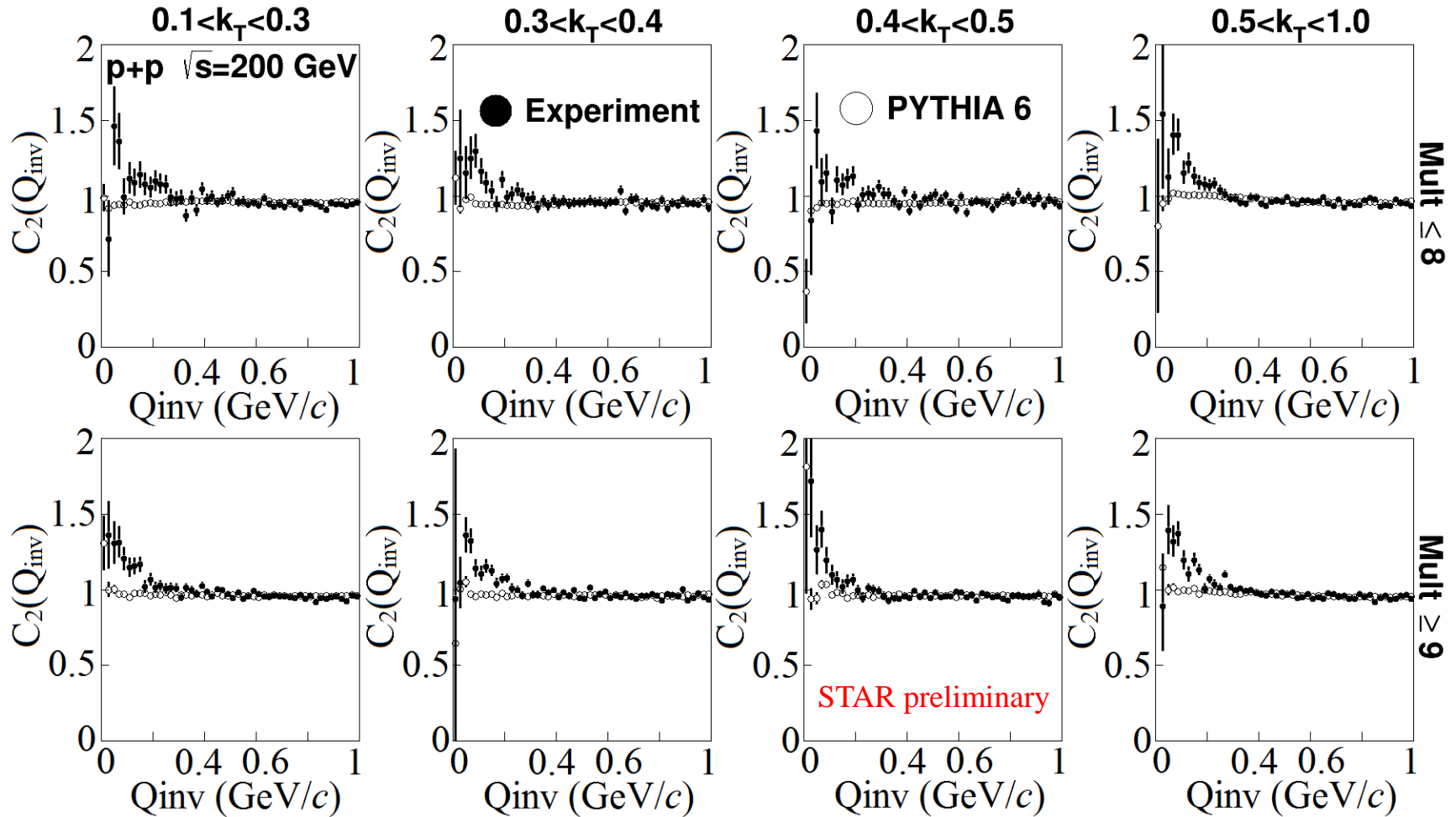
# Multiplicity dependence



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

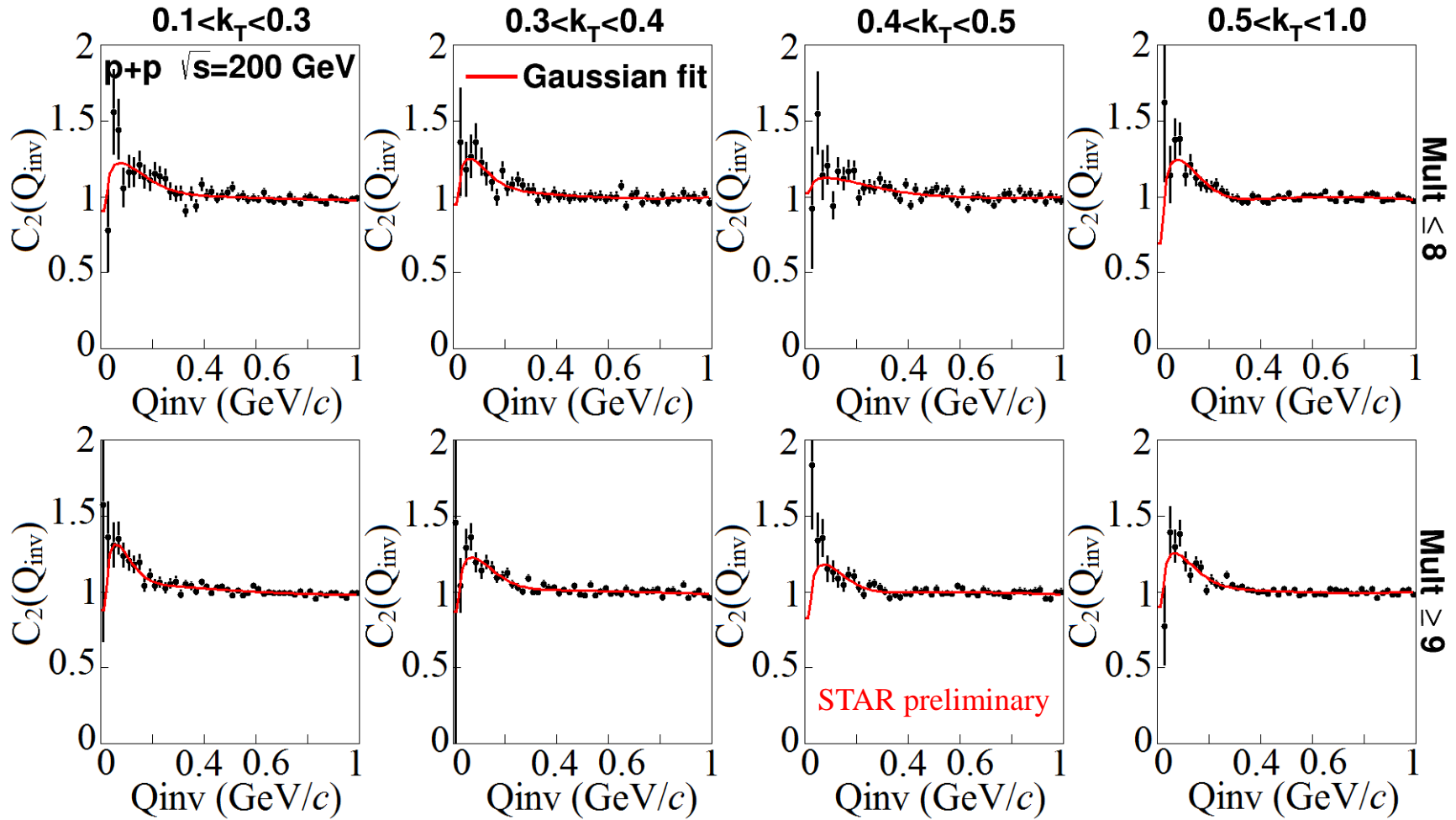
# Study the dynamical properties of the emitting source

$$k_T = |\vec{p}_{T1} + \vec{p}_{T2}|/2$$



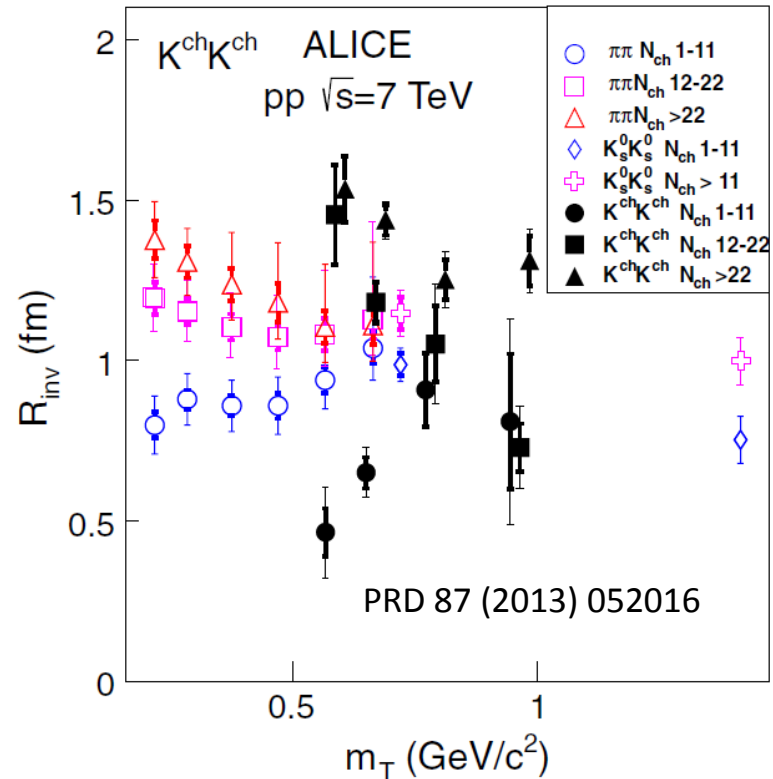
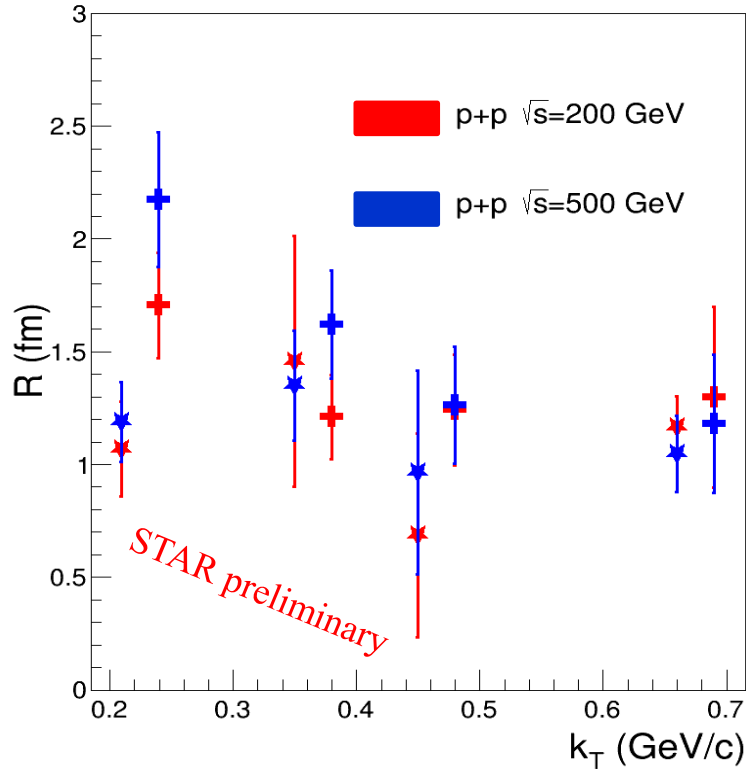


# Study the dynamical properties of the emitting source



# Study the dynamical properties of the emitting source

☆ Multiplicity  $\leq 8$     + Multiplicity  $\geq 9$

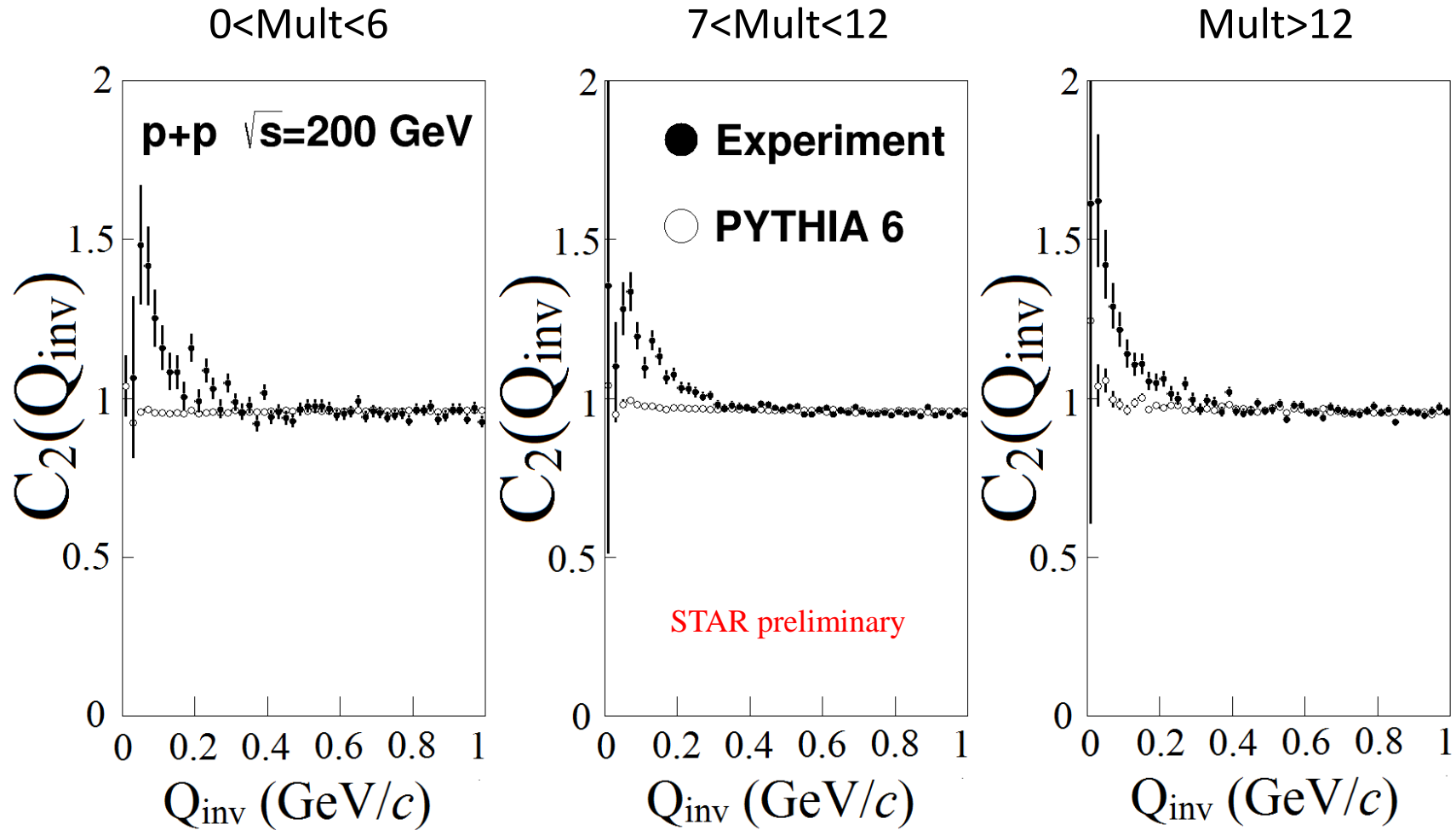


- The source radii feebly depend on the transverse pair momentum for both event multiplicities.
- Small difference in the measured emitting source radii between RHIC and LHC energies within current errors.

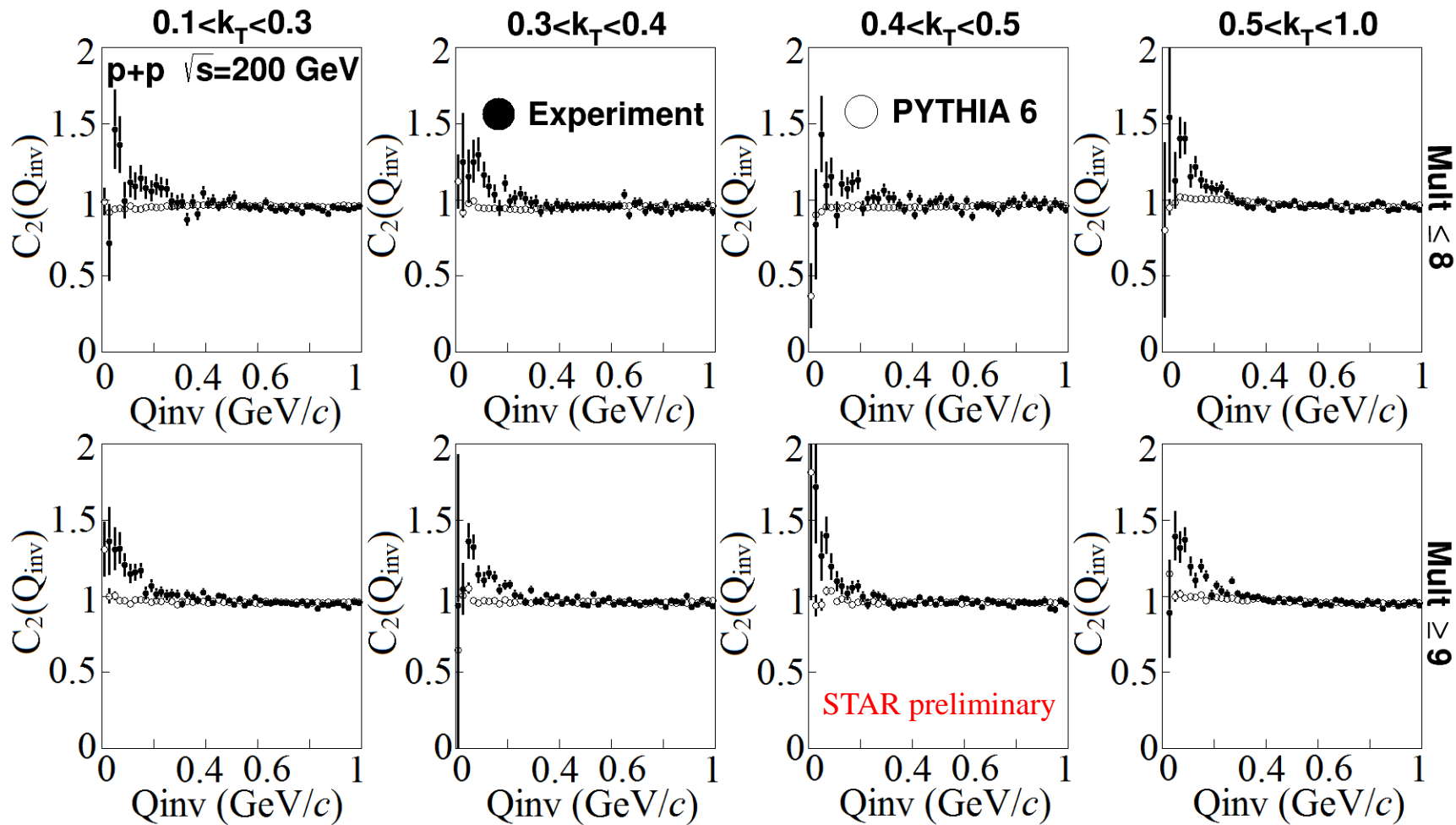
- The femtoscopic analysis of charged kaons in p+p collisions at RHIC energies has been presented
- Multiplicity dependence:
  - The source radii **increase with the multiplicity**
- Transverse pair momentum and multiplicity dependencies:
  - The source radii **weakly depend on  $k_T$**  for measured event multiplicity ranges
  - **Small difference** between RHIC and LHC energies within current errors

# BACKUP

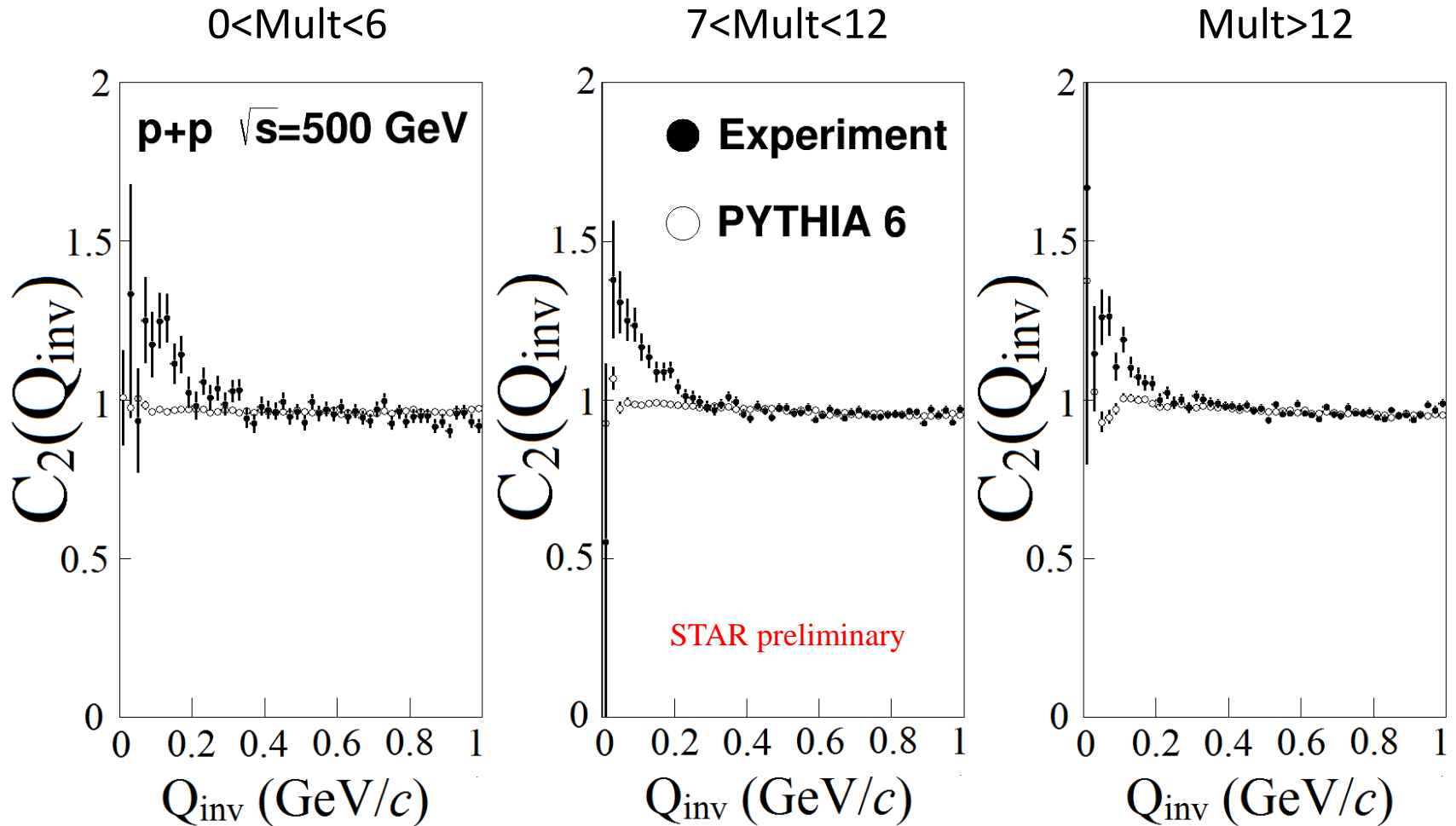
# Experiment vs. Simulation (Multiplicity dependence)



# Experiment vs. Simulation ( $k_T$ and multiplicity dependencies)

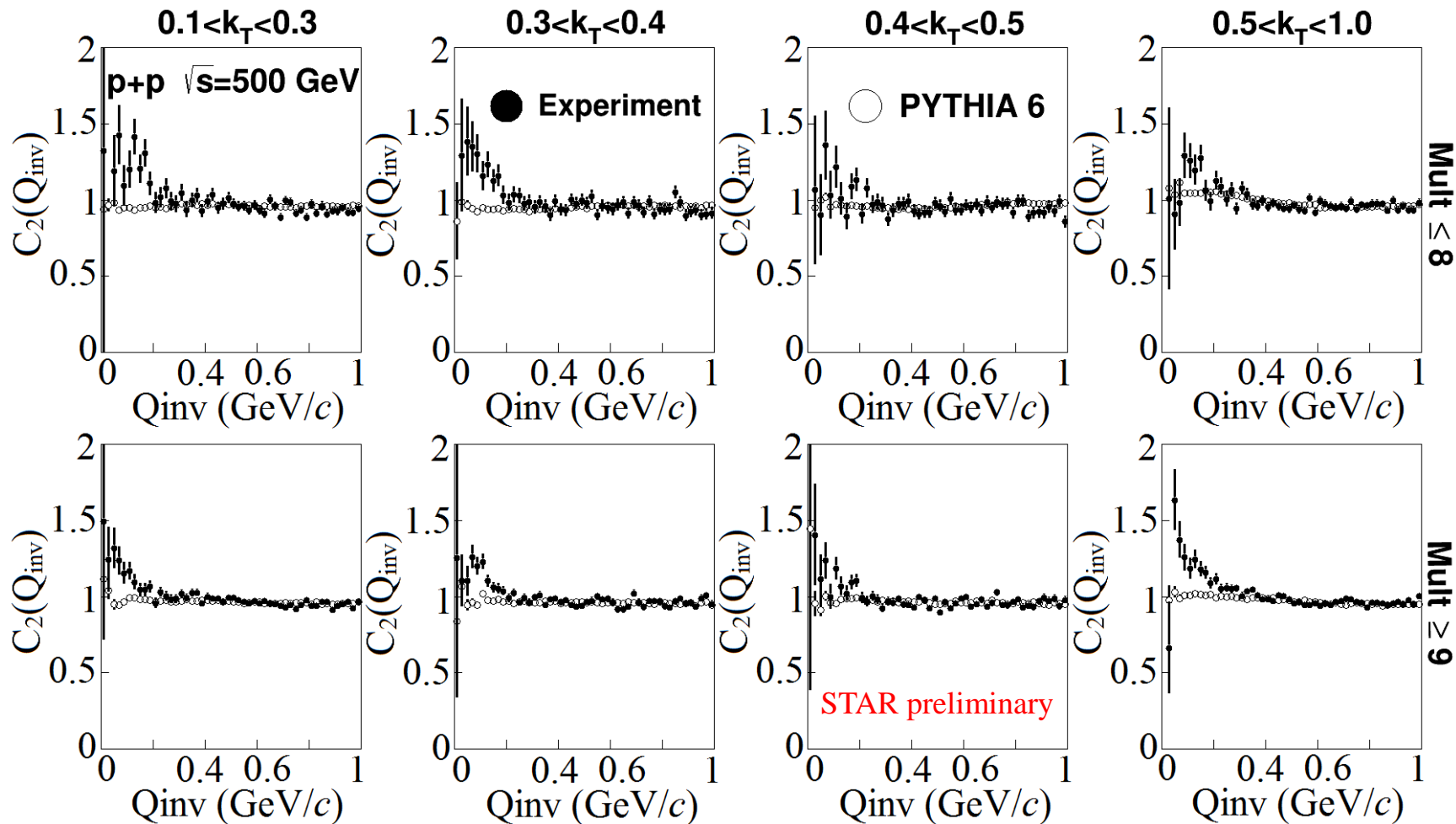


# Experiment vs. Simulation (Multiplicity dependence)



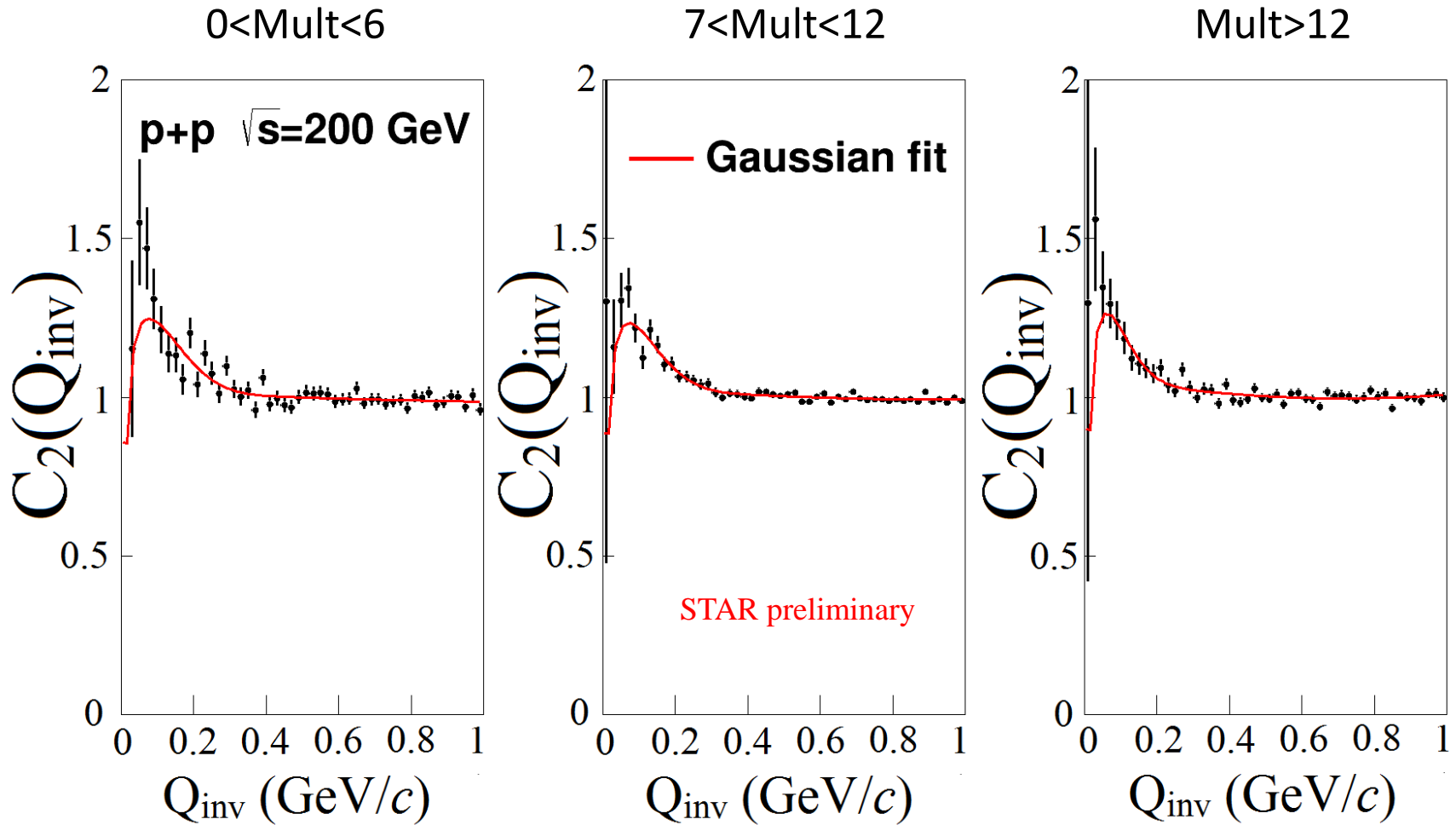
# Experiment vs. Simulation

## ( $k_T$ and multiplicity dependencies)

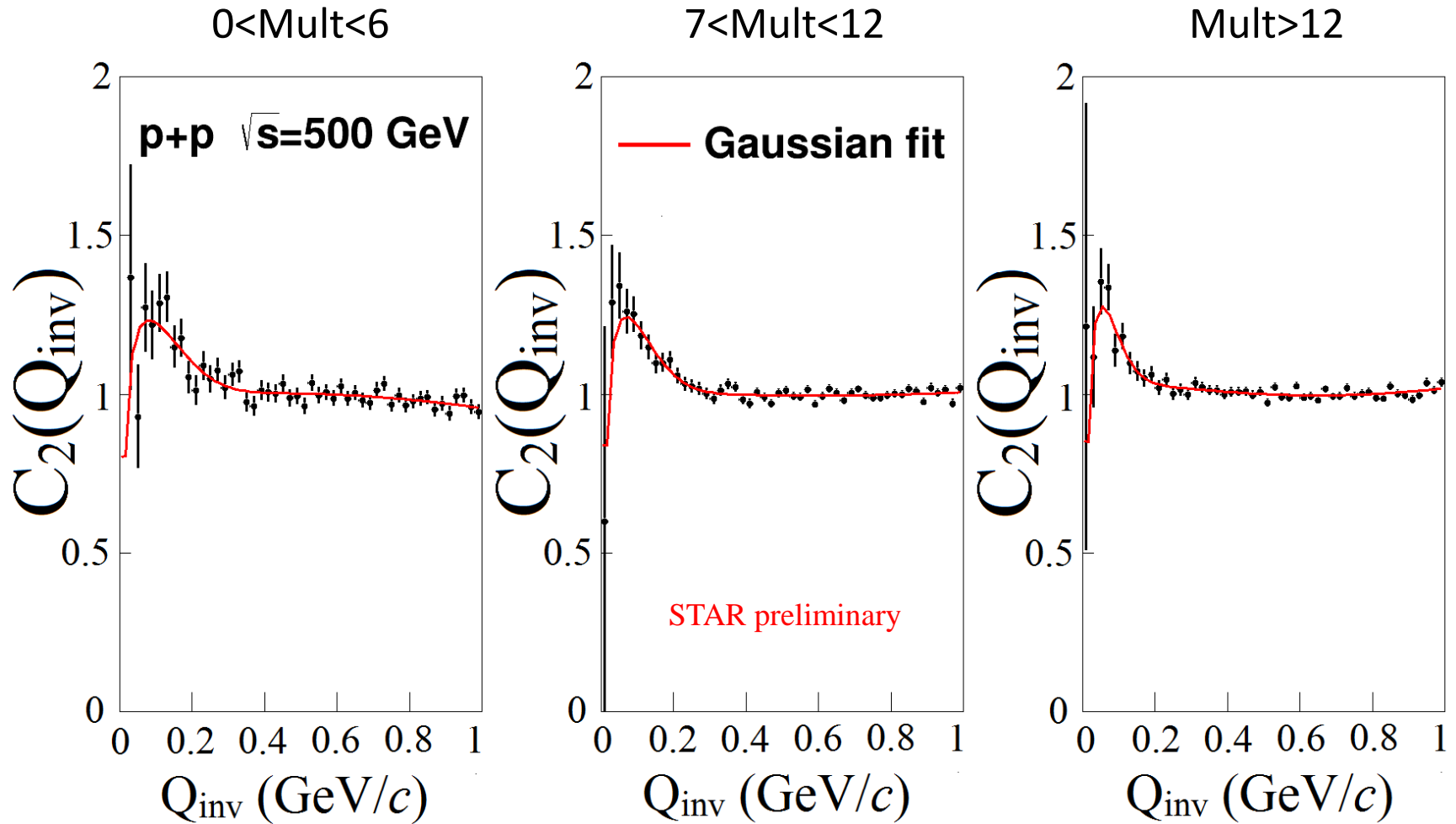




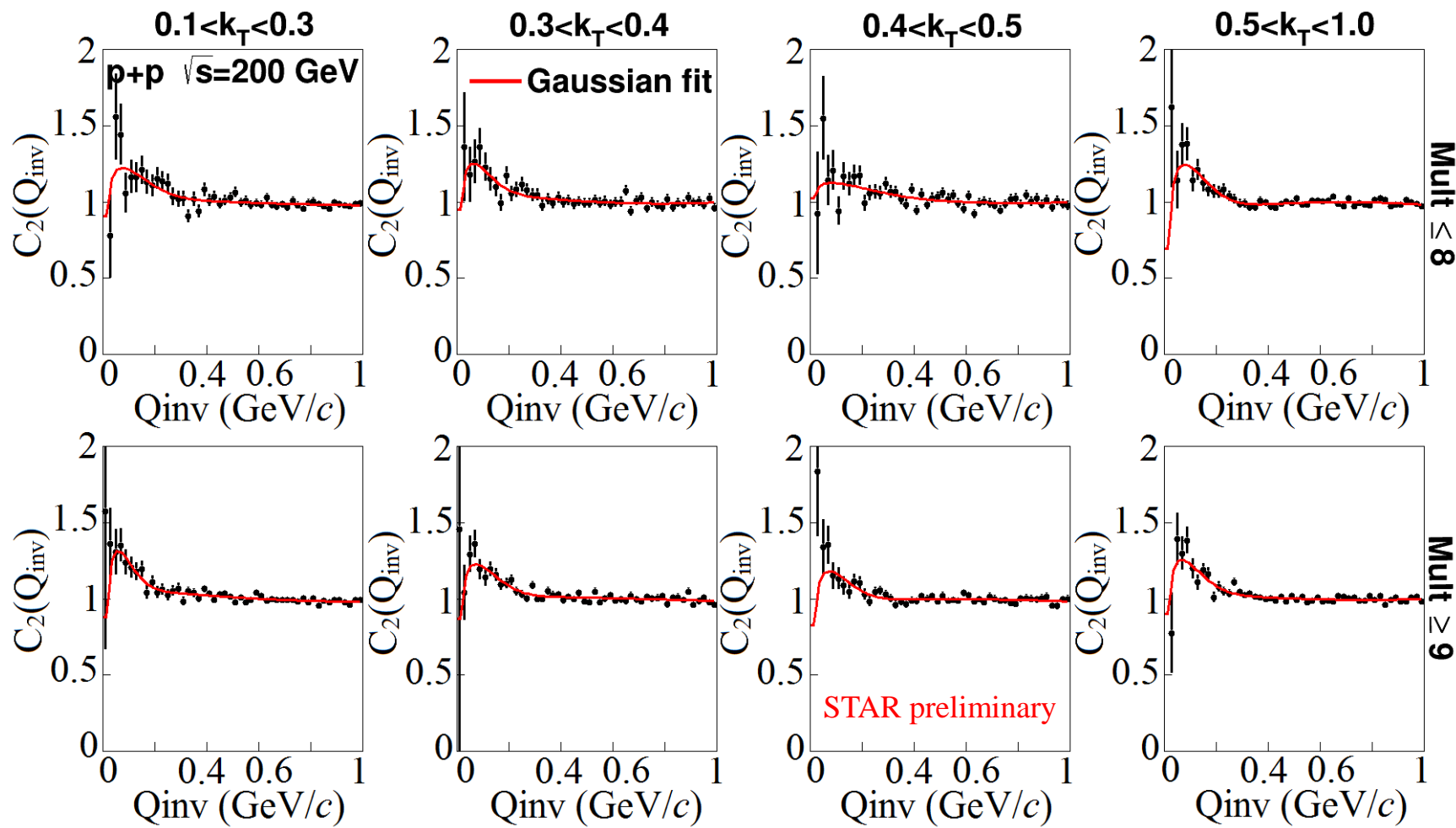
# Multiplicity dependence



# Multiplicity dependence



# $k_T$ and multiplicity dependence after correction on PYTHIA



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