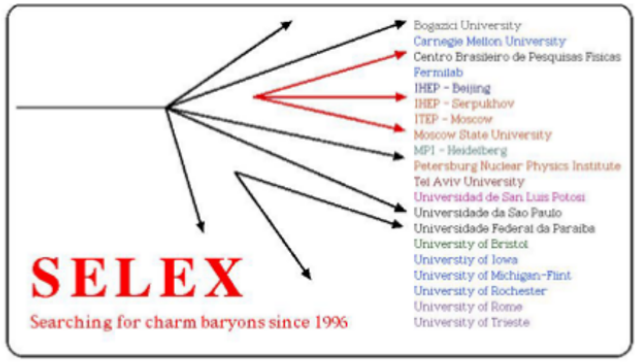

Correlation femtoscopy of kaons in the SELEX experiment

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(on behalf of the SELEX collaboration)
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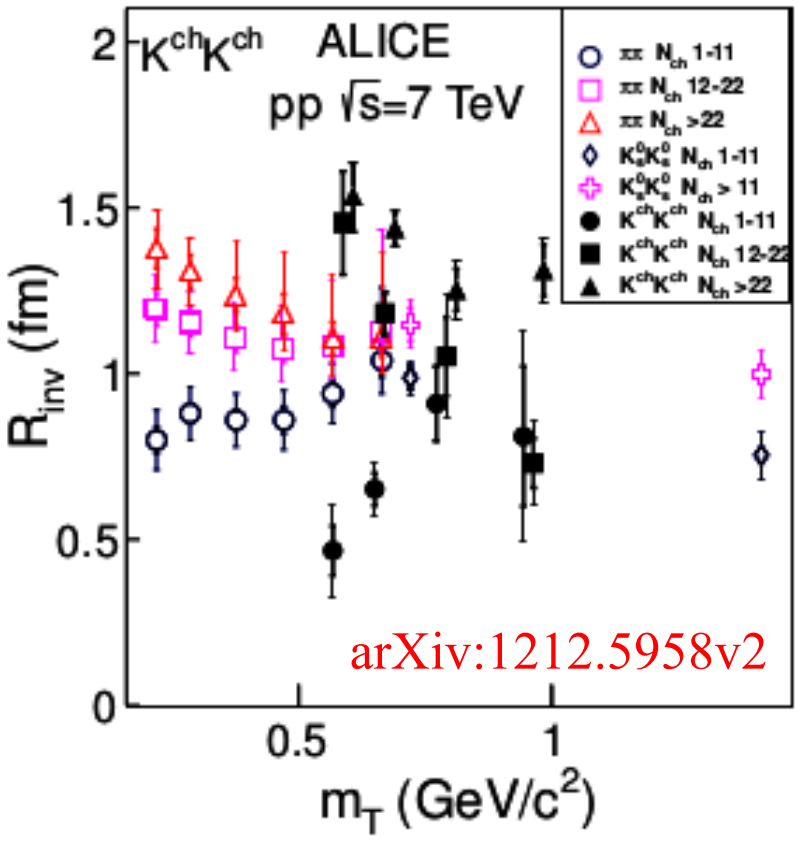
WPCF 2013 – IX Workshop on Particle Correlations and Femtoscopy
November 5-8, 2013
Acireale (Catania), Italy

Physical motivations:

- Study of space-time characteristics of the particle production in elementary particle collisions
- Charged kaons have a cleaner signal due to small contribution from the resonance decays
- Comparison of source parameters depending from the initial state; Study the beam particle fragmentation
- Study of the collective behavior via pair variables:
  - Transverse pair momenta
  - Longitudinal pair momenta



Correlation function parametrization

- Correlation functions are fitted by a single-Gaussian (Goldhaber parametrization):

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

- λ – strength of the correlations
- R – size of the emission source
- *K(Q)* is the Coulomb function integrated over a spherical source of 1 fm

M. Bowler, Phys. Lett.B 270,69(1991)

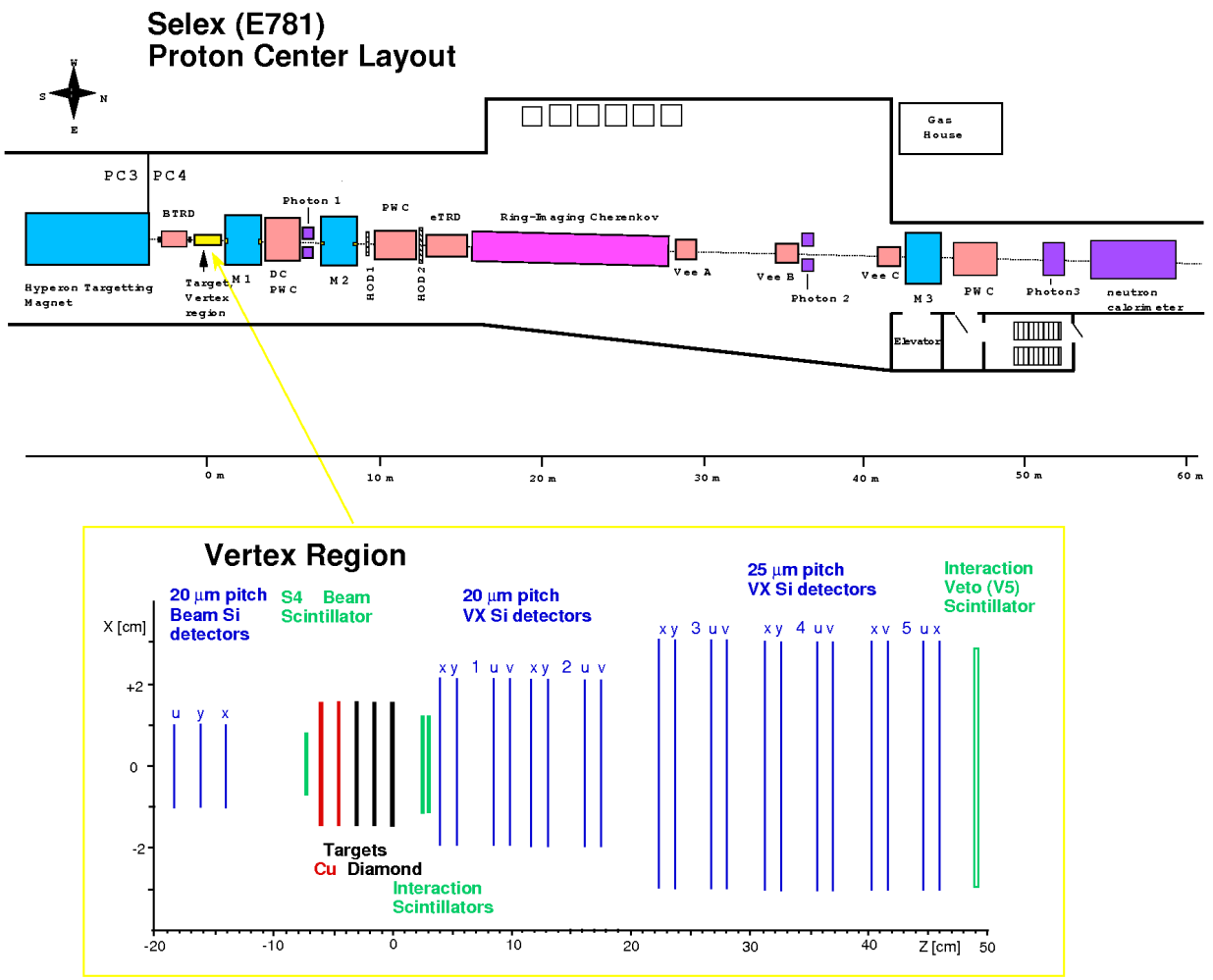
Y.Sinyukov, R.Lednicky, S.V.Akkelin, J.Pluta, B.Erazmus, Phys. Lett.B 432,248(1998)

- B(Q) – "baseline", takes into account all non-femtoscopic correlations, including the long-range correlations due to the energy-momentum conservation
- In order to obtain a baseline Pythia-6.4.27 Perugia 2011 tune was used
- Baselines are fitted by a standard 2nd order polynomial:

$$B(Q) = 1 + a\,Q + b\,Q^2$$

Phys.Rev.D85:074023,2012

SEgmented LargE X_F baryon spectrometer (E-781)

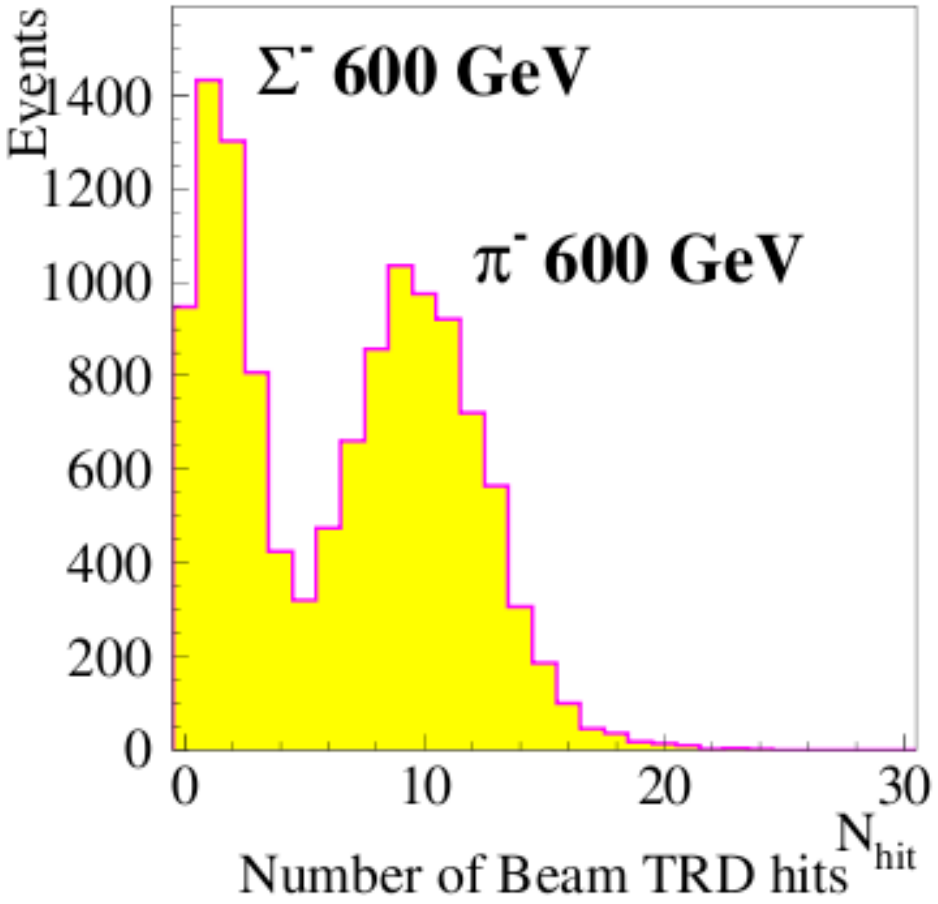


- 600 GeV/c Σ^- and π^- beams
- 540 GeV/c *p* beam
- Copper and carbon composite target with 5% of an interaction length for protons
- ~10^9 trigger events
- Momentum resolution:

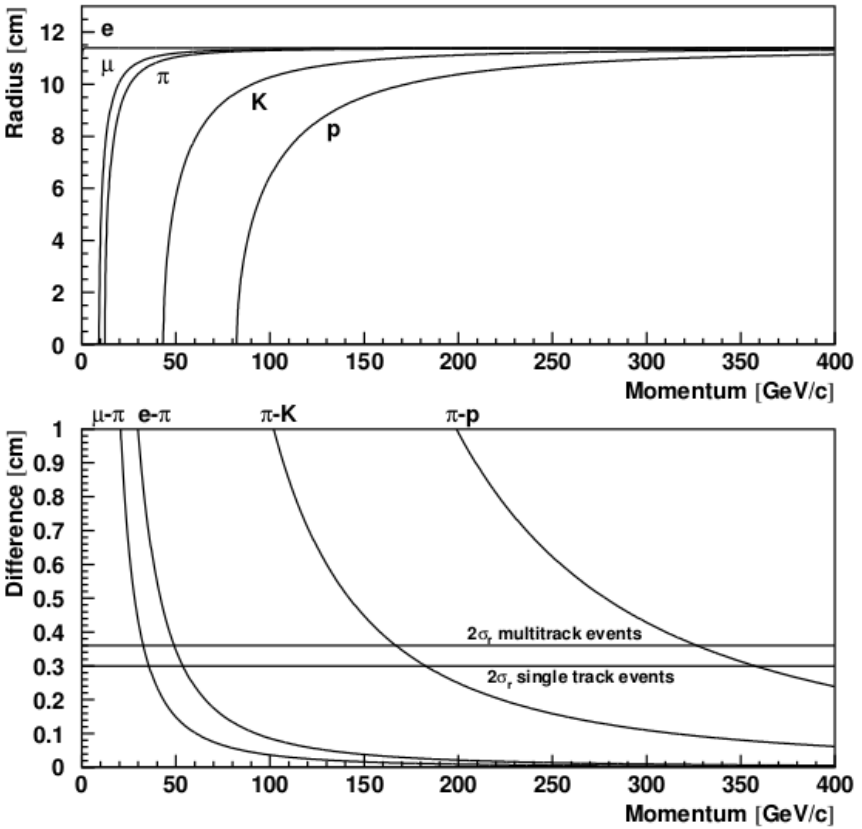
  $\sigma_p/p_z \approx 1\%$ and $\sigma_p/p_t \approx 0.5\%$

Charged particle identification

Beam TRD



Ring Imaging Cherenkov detector



≥2σ K/(π,p) separation
46 to 165 GeV/c

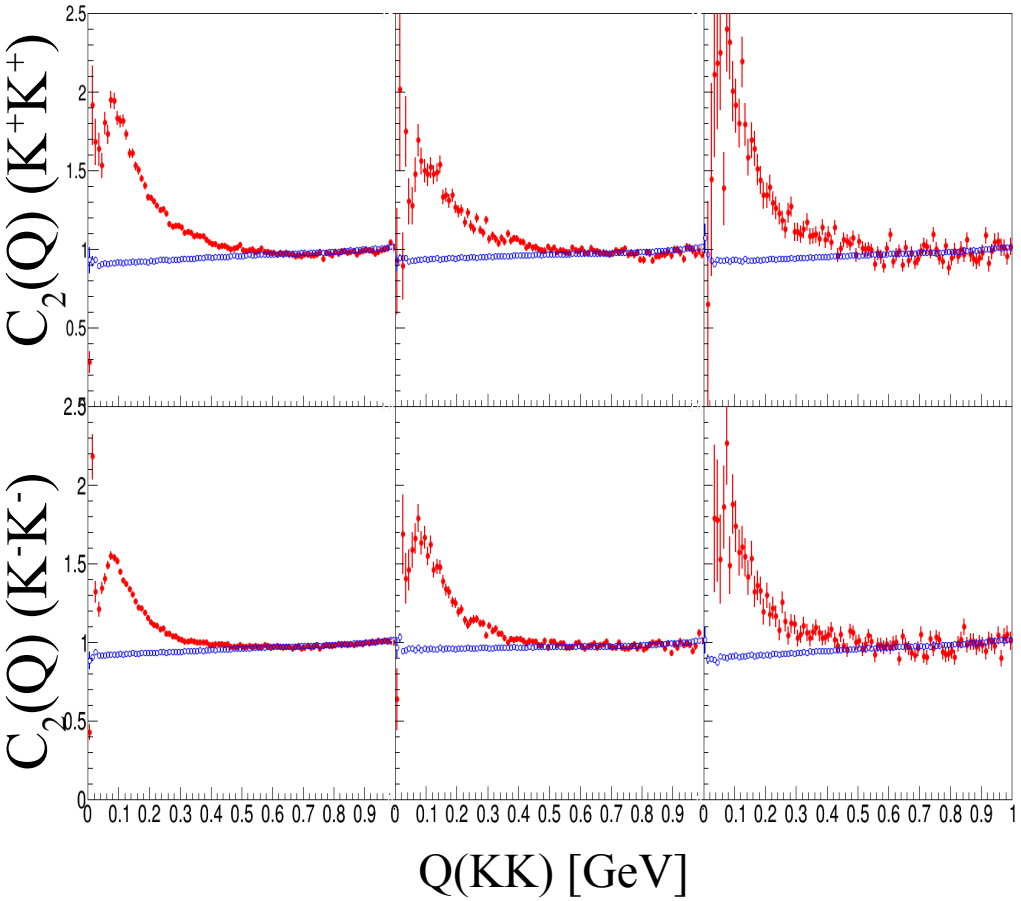
The dependence of the emission source radii on the initial state

The dependence of the emission source radii on the initial state

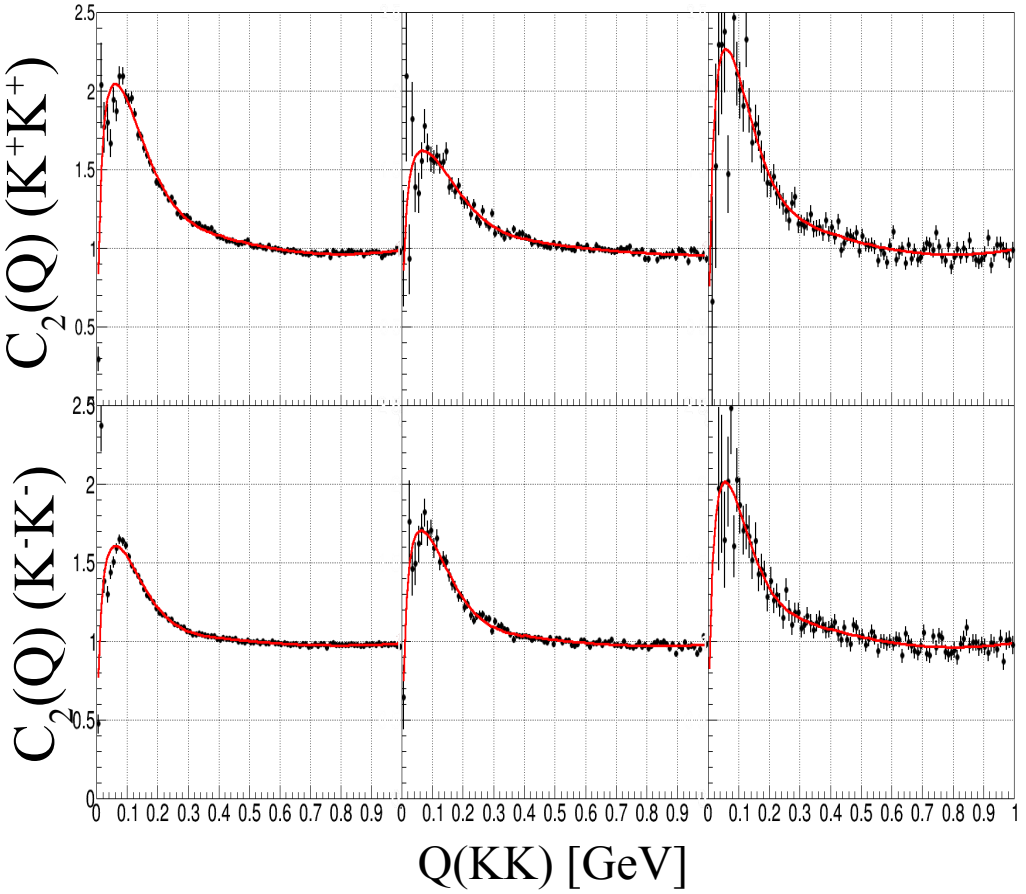
● Experimental data

○ Pythia-6.4.27 Perugia 2011 tune

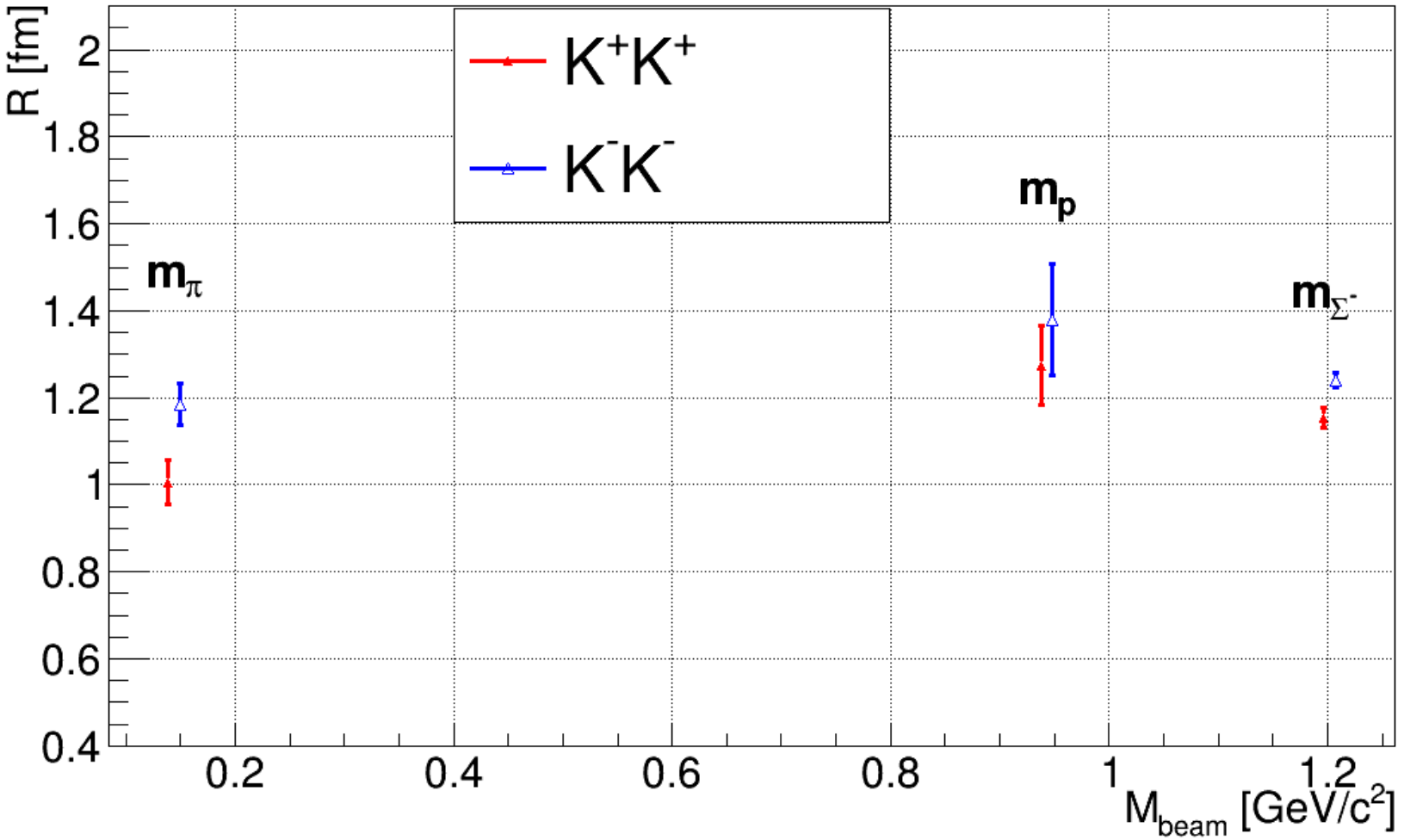
Σ^- beam π^- beam p beam



Σ^- beam π^- beam p beam

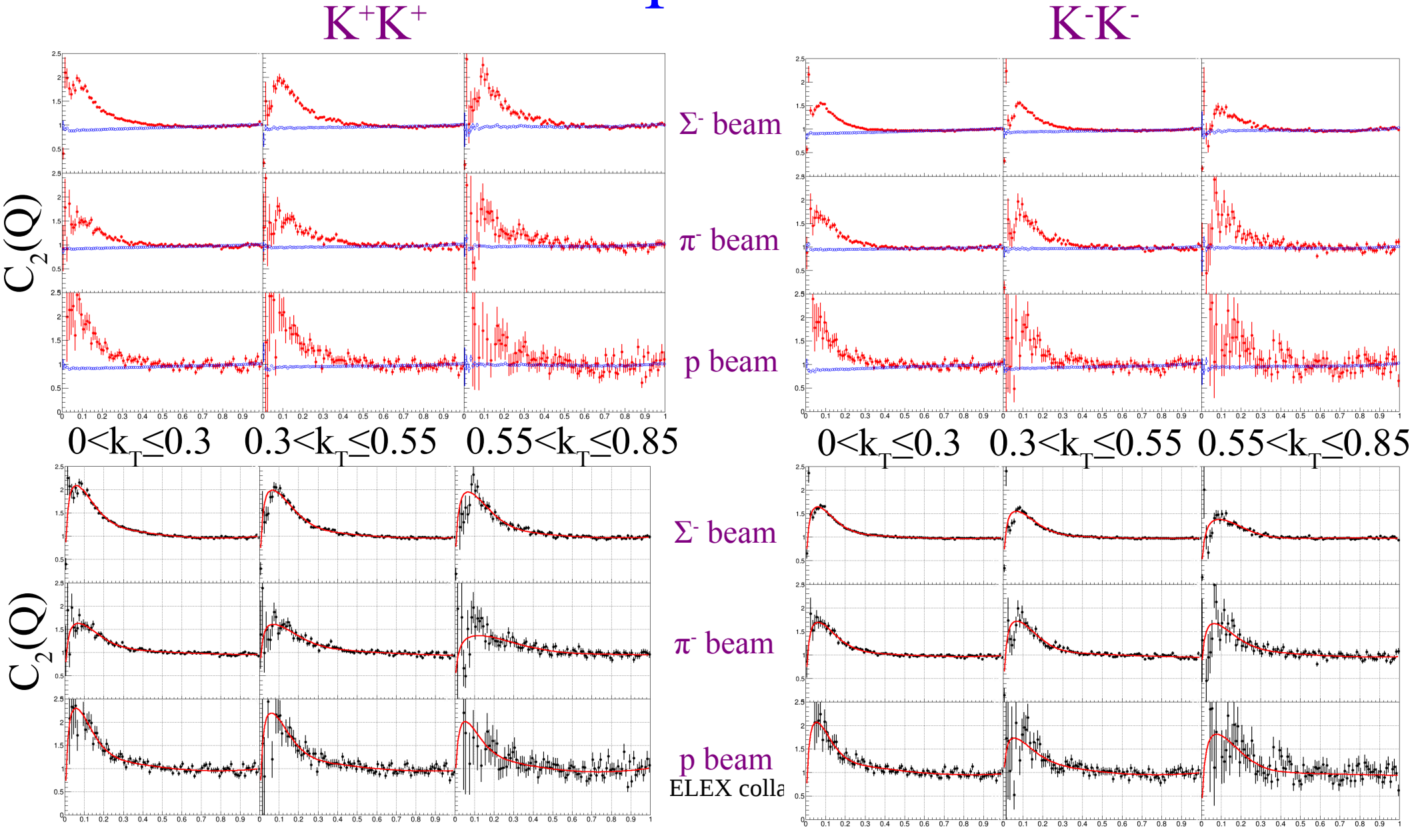


The dependence of the emission source radii on the initial state



The source radii dependencies on the pair k_T

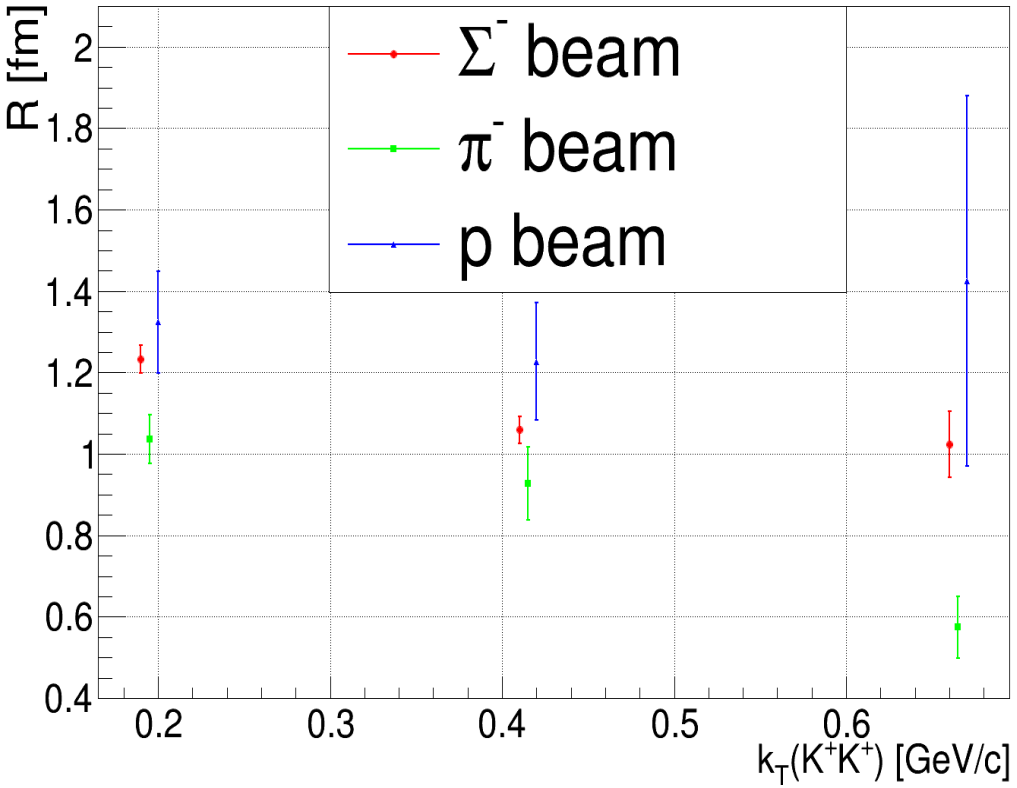
Pair k_T dependence of the emission source parameters



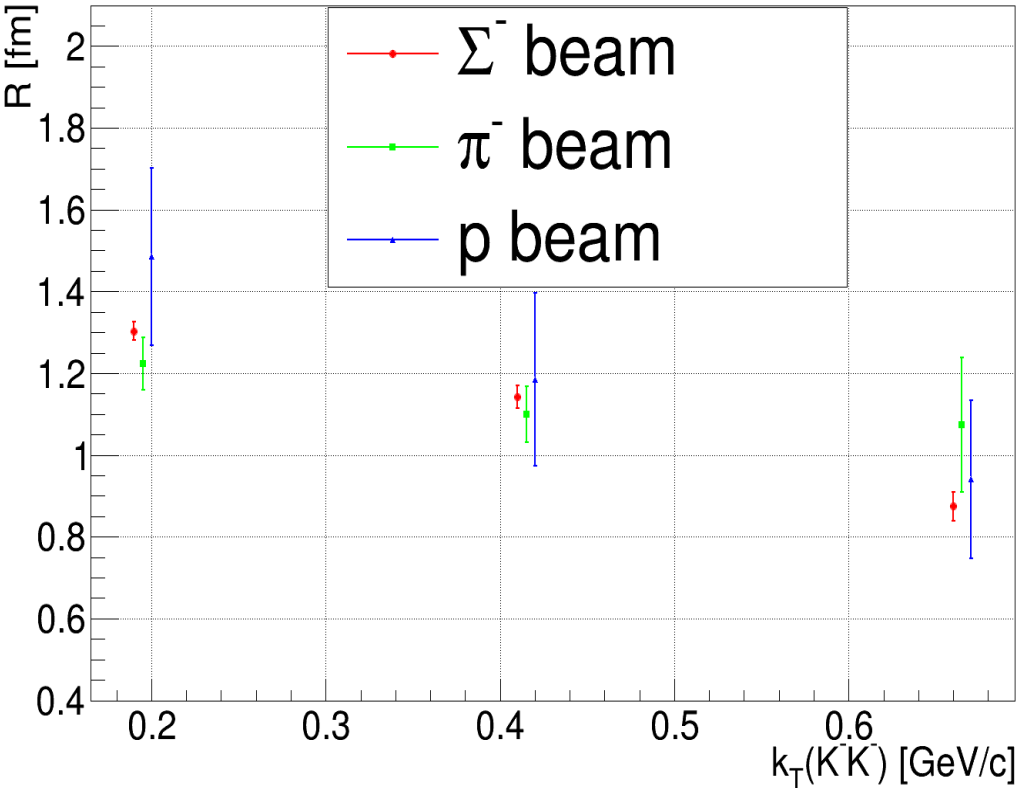
ELEX colla

Pair k_T dependence of the emission source parameters

K^+K^+

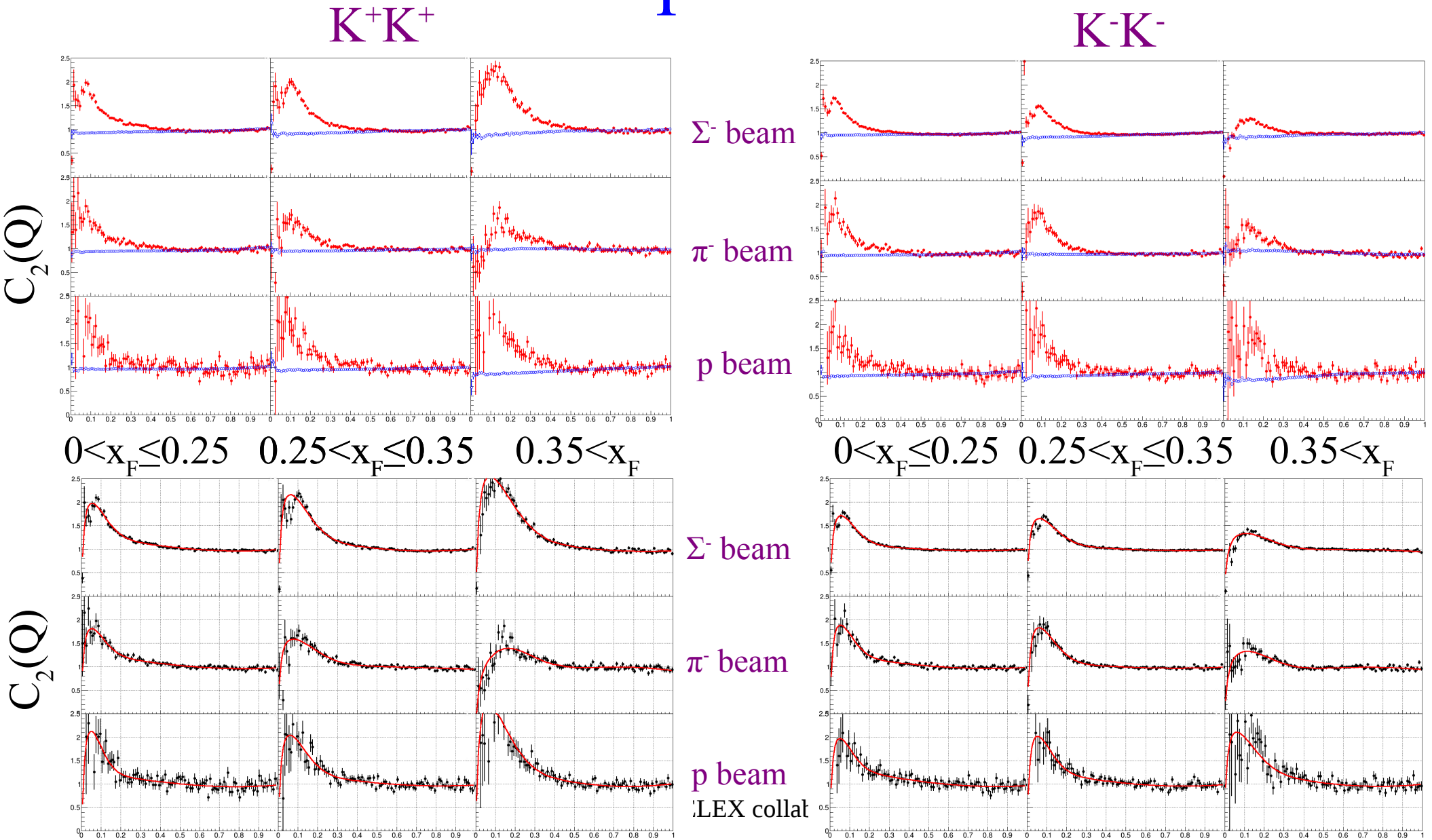


K^-K^-



The source radii dependencies on the pair Feynman variable x_F

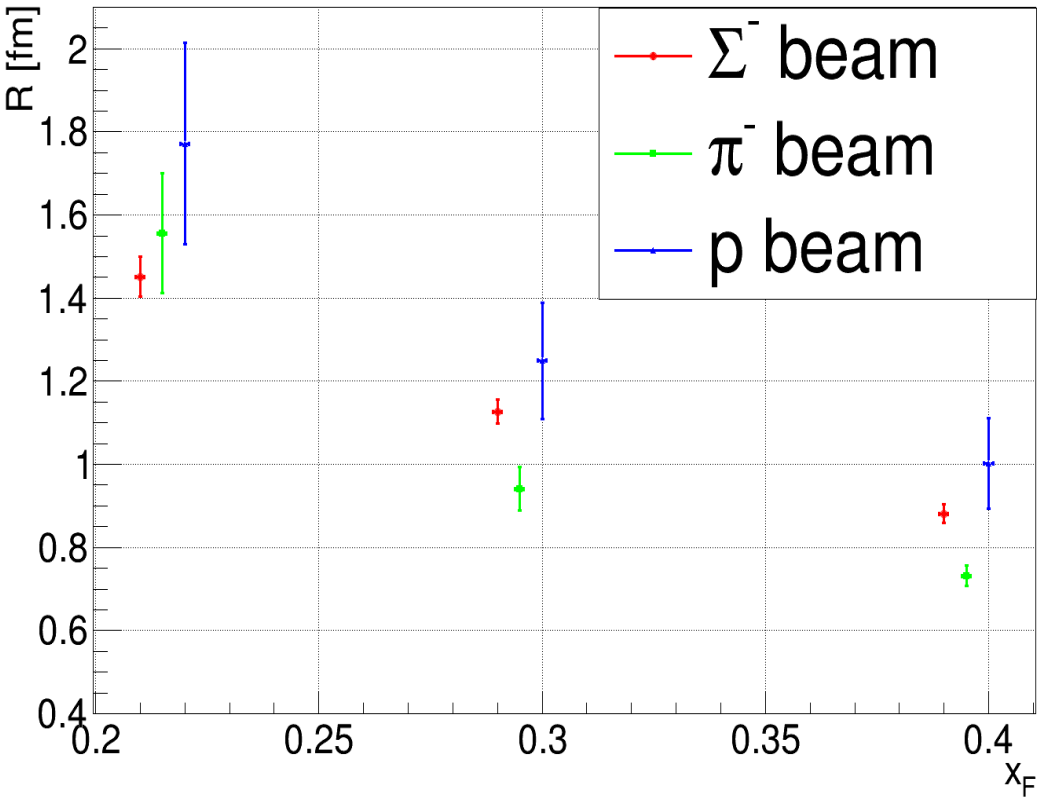
Pair x_F dependence of the emission source parameters



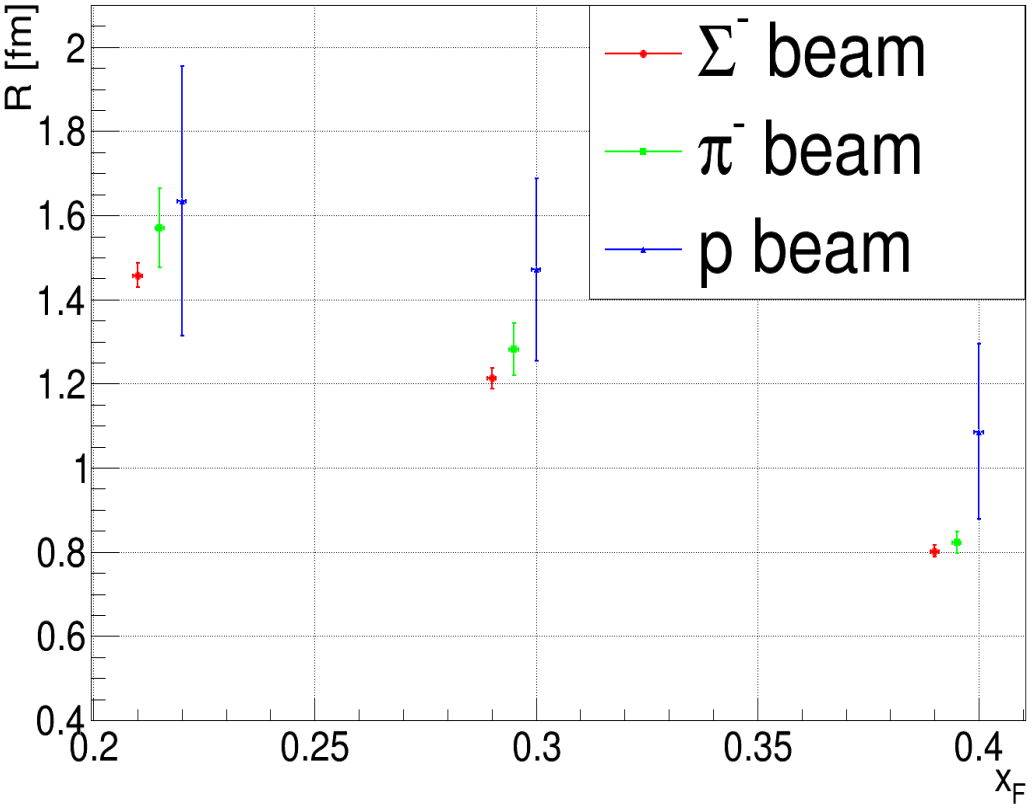
LEX collab

Pair x_F dependence of the emission source parameters

K^+K^+



K^-K^-

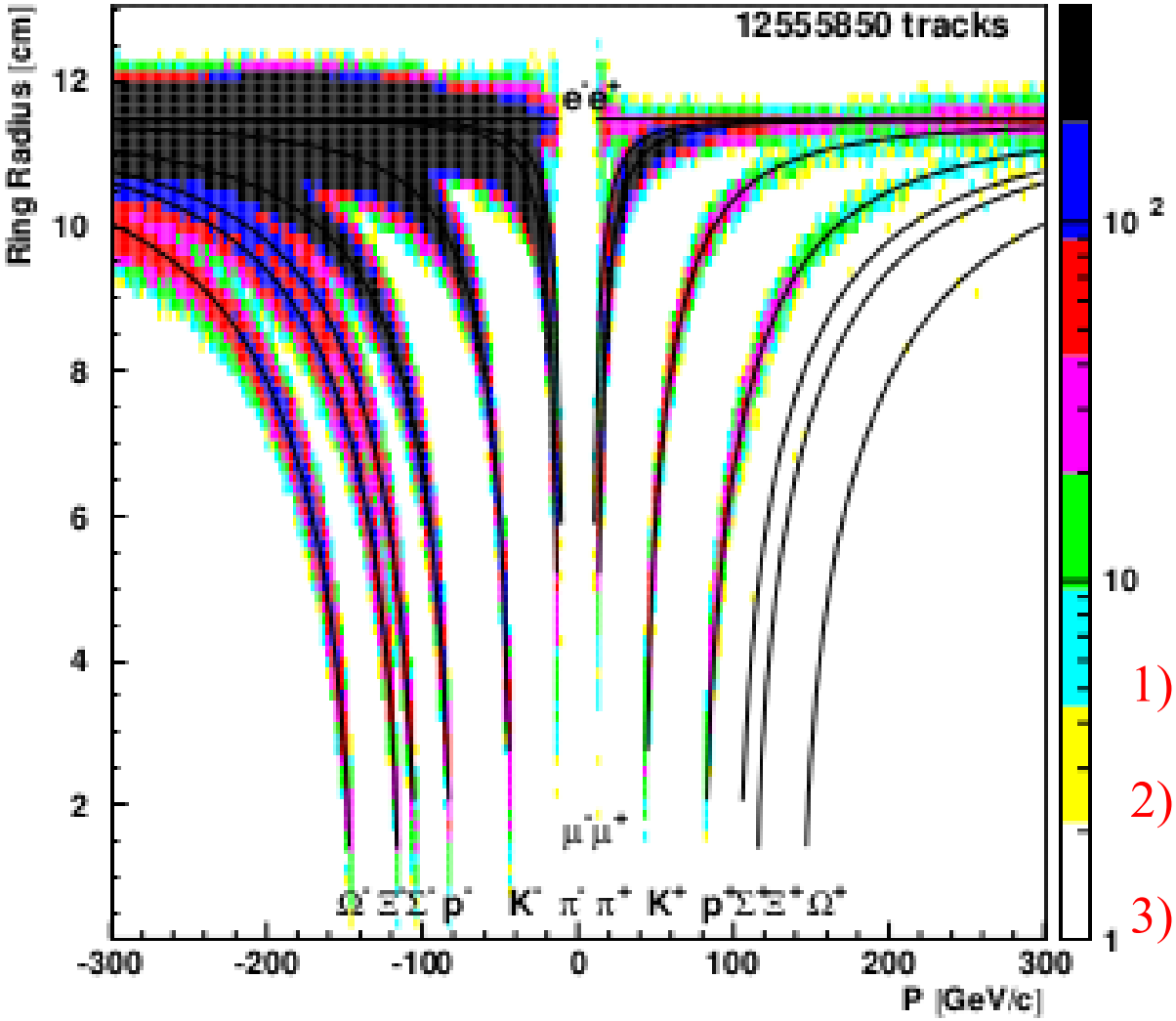


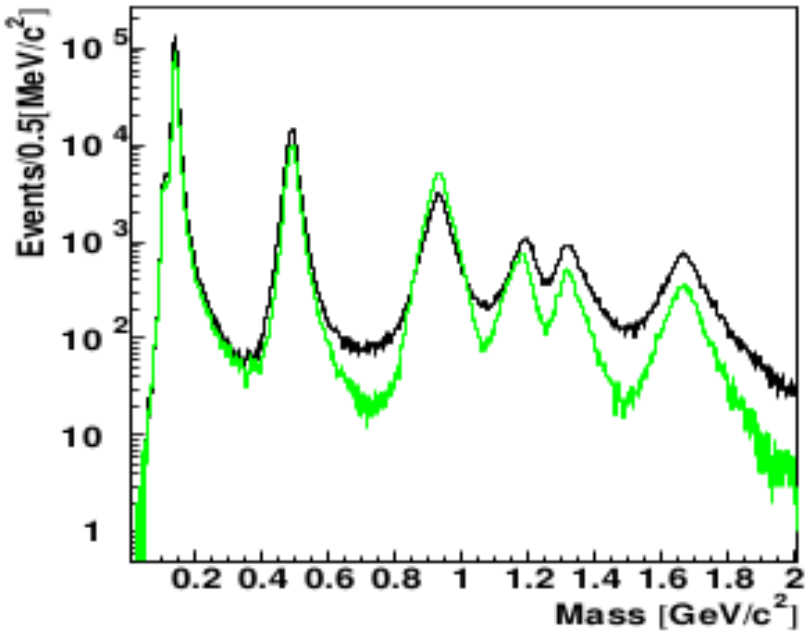
Summary

- Charged kaon correlations at small relative momentum have been measured in the SELEX experiment
- The decreasing of the emission source radii with pair transverse momentum has observed for all beam types (Σ^-, π^-, p)
- The first time the dependence of the emission source on the Feynman scaling variable has been observed
- The decreasing of the source radii with x_F has been measured for Σ^-, π^- and p beams

Backup slides

Particle identification with RICH detector





1) Nucl.Instrum.Meth. A431 (1999) 53-69
arXiv:hep-ex/9811001v1
2) Nucl.Instrum.Meth.A502:285-288,2003
arXiv:hep-ex/0208046v1
3) Nucl.Instrum.Meth.A639:246-248,2011
arXiv:1008.4171v2