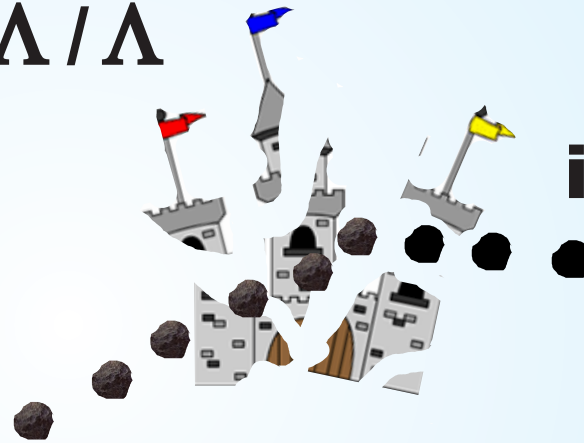


Scaled momentum distributions for

K_S^0 and $\Lambda/\bar{\Lambda}$



DESY 11-205



in DIS

Why, How, What

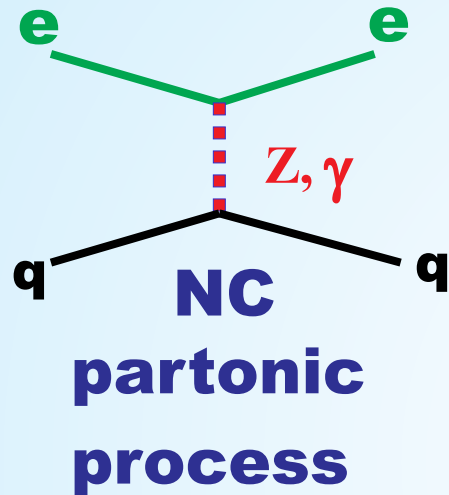


Bonn 28.3.2012

I.Abt, MPI München



Motivation



a miracle happens

It is not just perturbative QCD



K_S^0

$\bar{\Lambda}$

Λ

strange hadrons

data to fit

Lund string model + leading log parton shower MC

or

fragmentation functions – leading – twist collinear factorisation

Predictions

Factorisation:

$$\sigma(ep \rightarrow e + H + X) = \sum_{j,j' = q,\bar{q},g} f_{j/p}(x, Q) \otimes \hat{\sigma}_{jj'}(x, Q, z) \otimes F_{H/j'}(z, Q)$$

proton
pdf

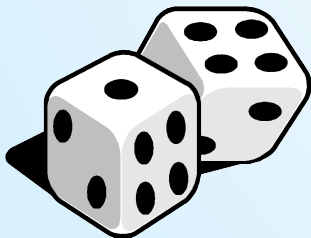
partonic
cross
section

Hadronisation
Fragmentation
Function

NLO QCD

AKK+CYCLOPS: Albino, Kniehl, Kramer $e^+ e^-$

DSS: De Florian, Sassot, Stratmann $e^+ e^- + pp + ep$



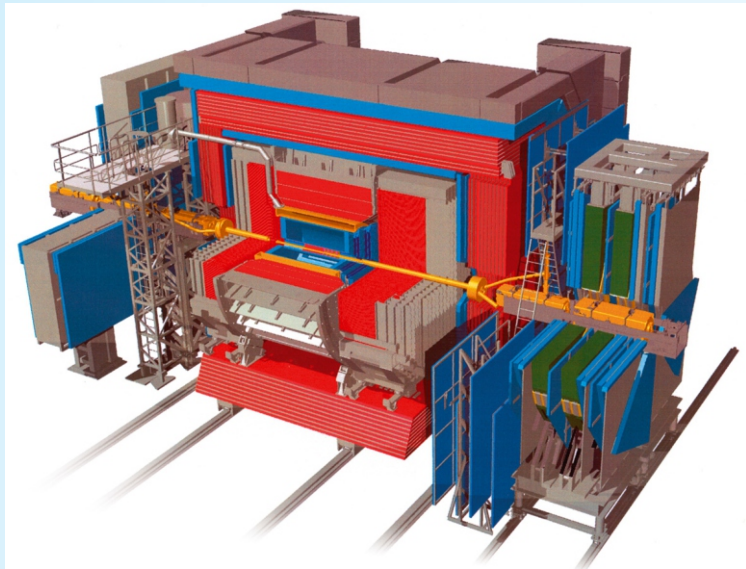
Monte Carlo: LEPTO

CDM color dipole model [ARIADNE]

MEPS model [LEPTO]

Lund string model

Experiment



**Standard NC event
selection 330 pb^{-1}**

**Track and Secondary
Vertex based selection
of K_S^0 and $\Lambda/\bar{\Lambda}$**

Details in DESY 11-205

$$10 < Q^2 < 40000$$

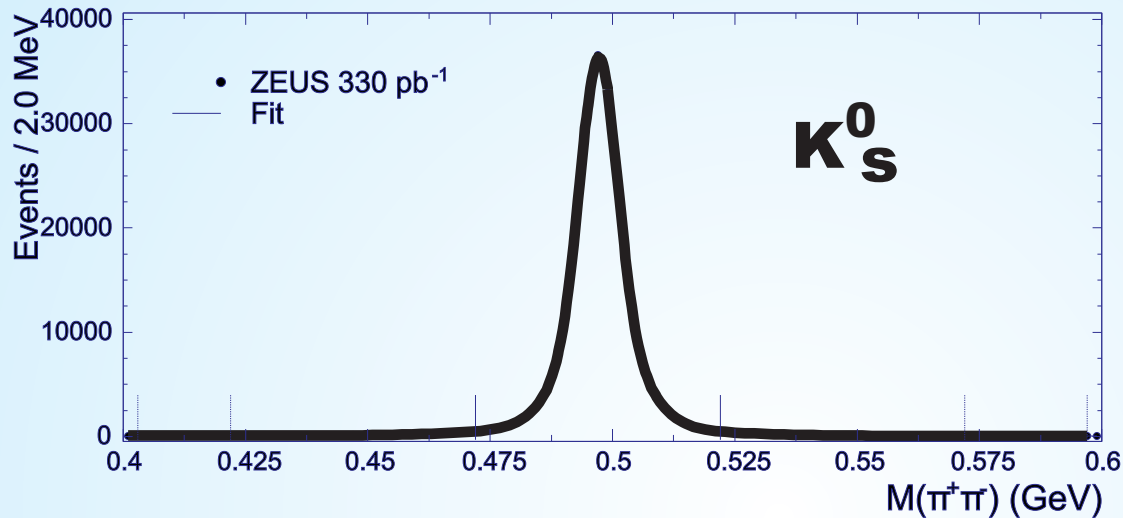
$$0.001 < x < 0.75$$

$$x_p = 2 P^{\text{Breit}} / \sqrt{Q^2}$$

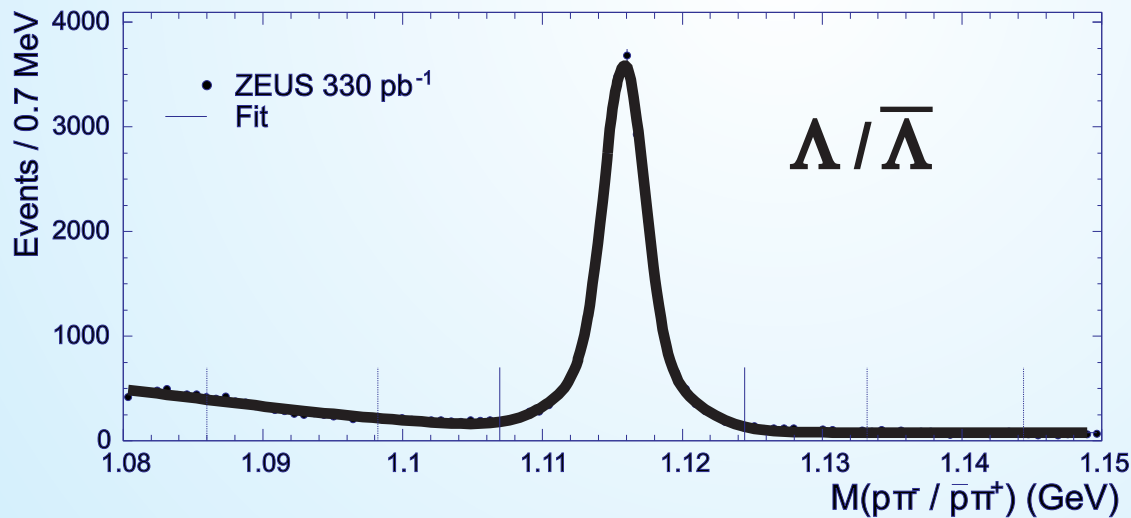
$$q = (0, 0, -Q) \text{ Breit frame}$$

**estimator of the fraction that the hadron
carries from the parton momentum**

Signal

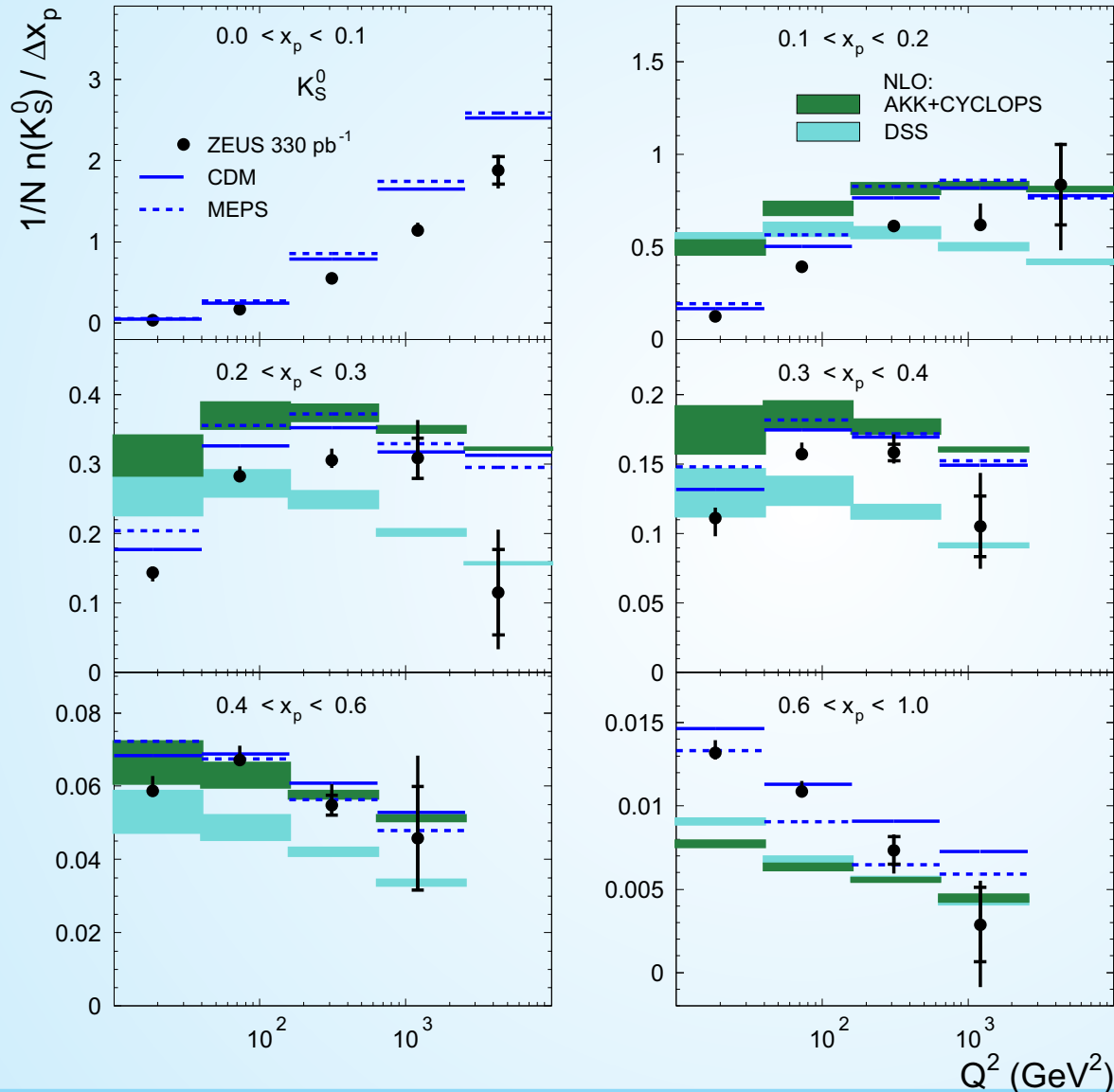


806505 events
→
**238153 in
current region
of Breit frame**



165875 events
→
40728

Scaled Momentum Distribution



K_S^0

**scaling violation:
Q increases**

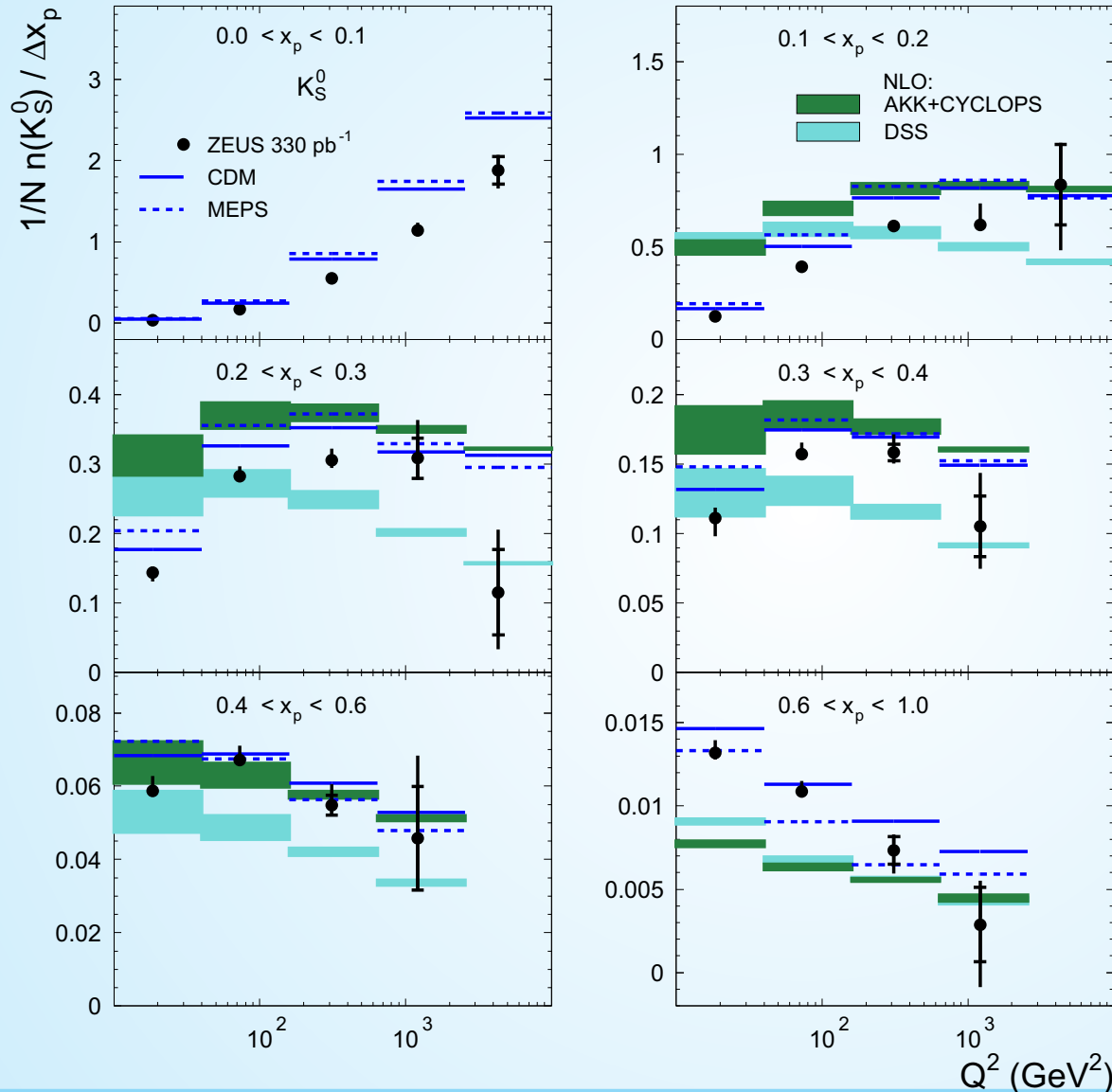
⇒

**more soft gluon
radiation**

⇒

**more particles
with low x_p**

Scaled Momentum Distribution



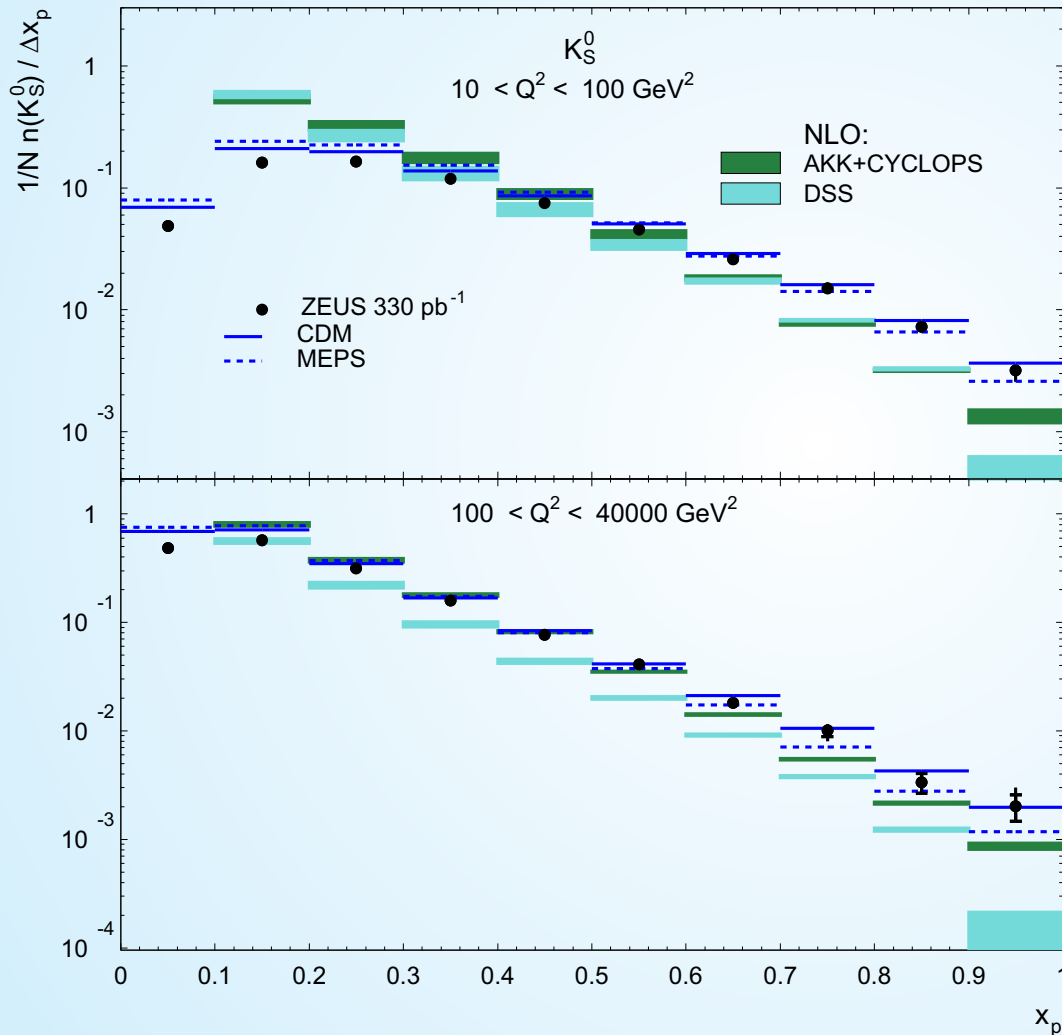
K_S^0

Fragmentation Functions, based on e^+e^- only, fail.

The ones based also on pp and ep don't do much better.

MCs are quite reasonable.

Scaled Momentum Distribution

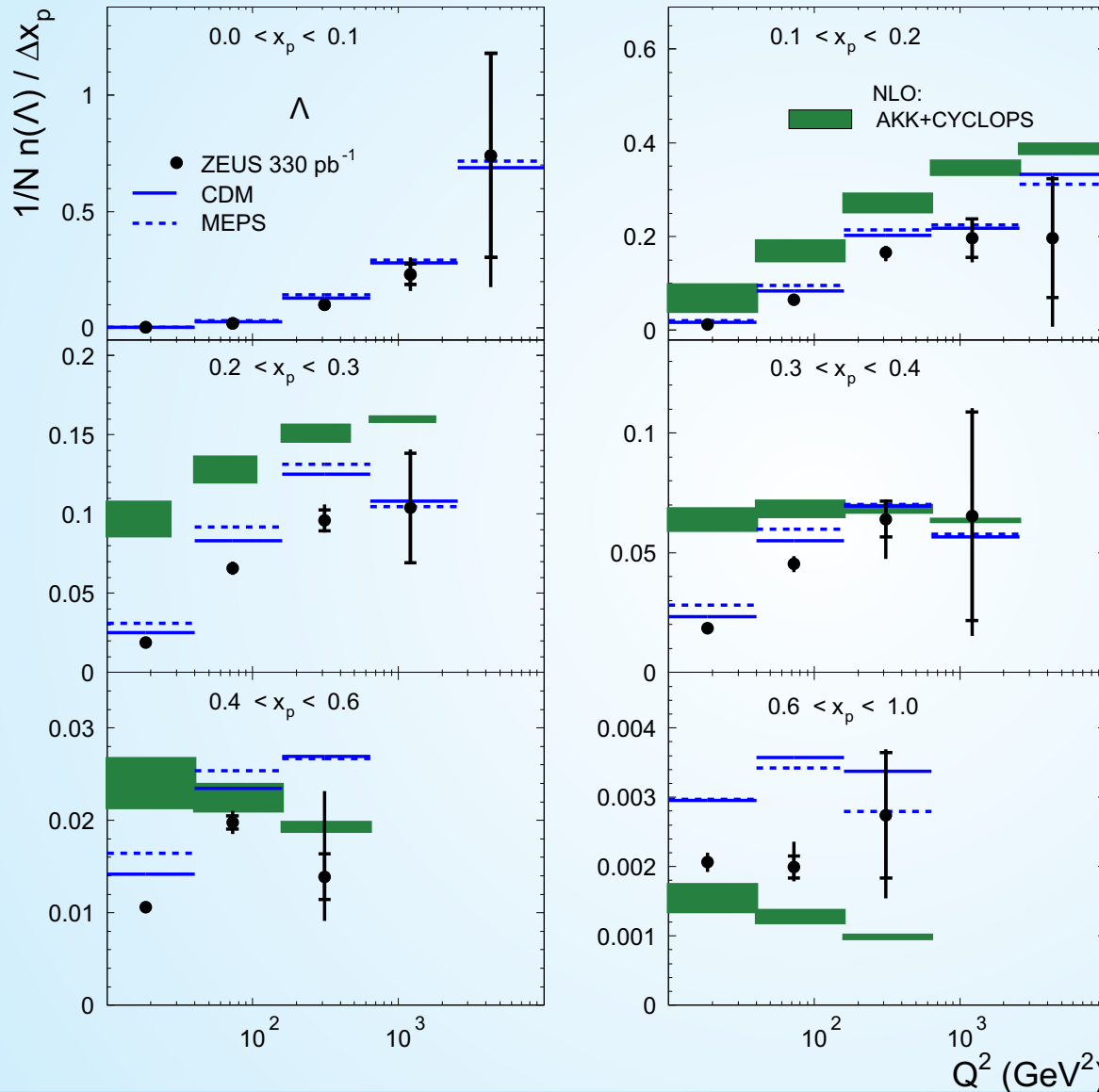


K_S^0

Fragmentation Functions predict too steep spectra.

They just had not enough previous input.

Scaled Momentum Distribution



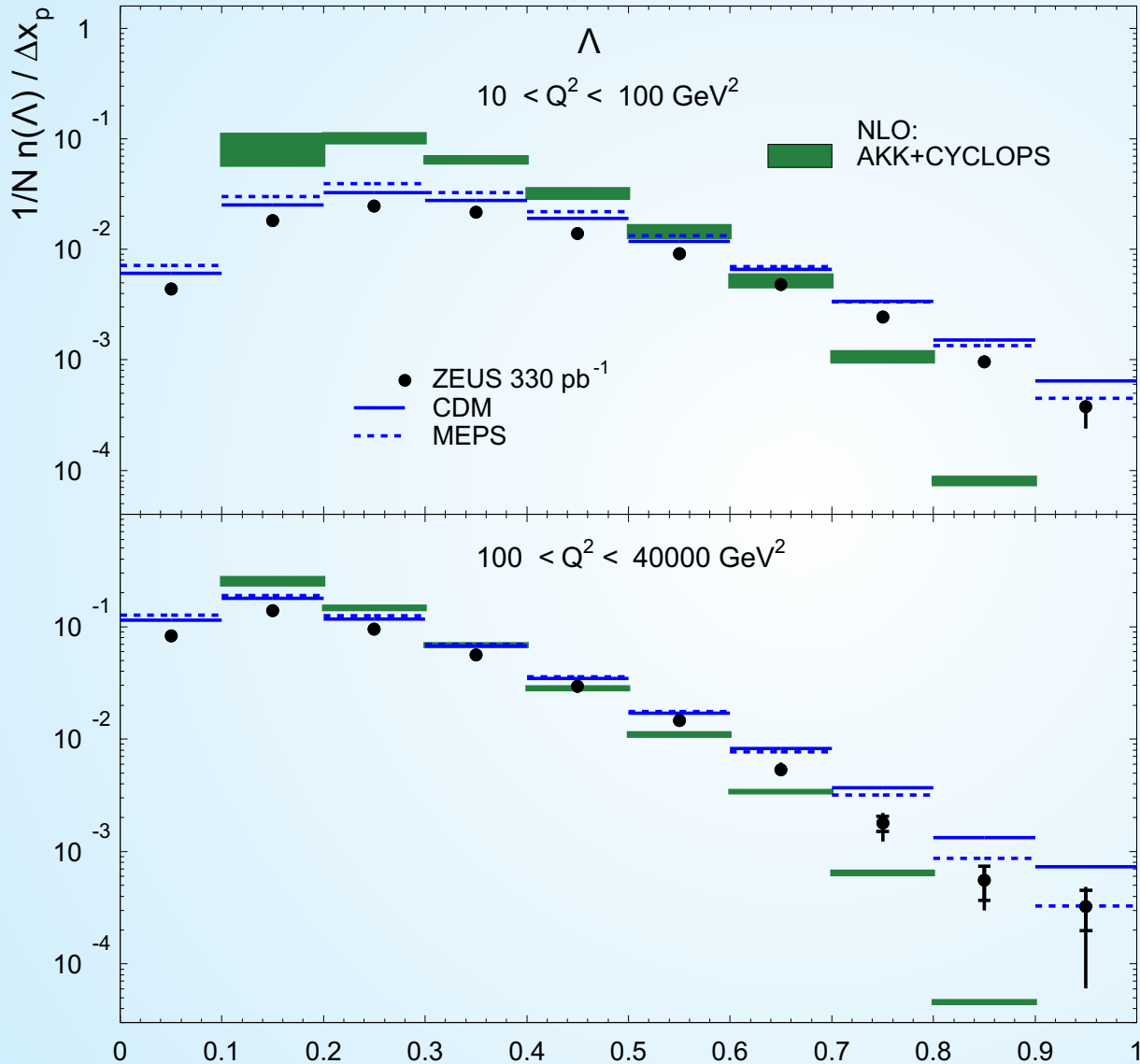
$$\Lambda / \bar{\Lambda}$$

again: scaling violations

MC are still reasonable

Fragmentation Functions, based on $e^+ e^-$ only, fail

Scaled Momentum Distribution

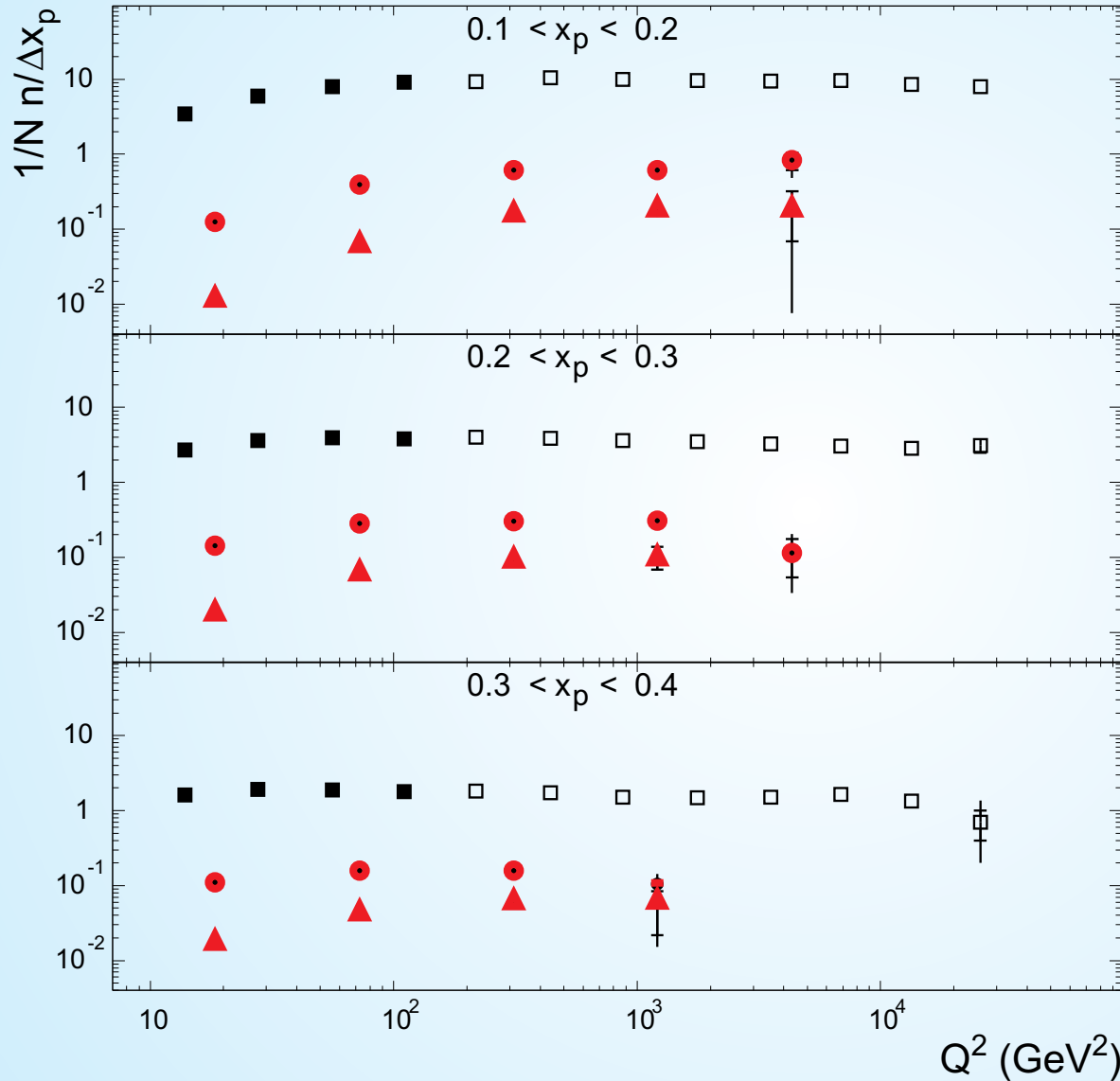


$$\Lambda / \bar{\Lambda}$$

Fragmentation Functions, based on $e^+ e^-$ only, predict a too steep spectrum.

MC are still reasonable

Scaled Momentum Distribution



inclusive charged particles:

- ZEUS 440 pb⁻¹
- ZEUS 38 pb⁻¹

strange hadrons:

- K_S⁰ ZEUS 330 pb⁻¹
- ▲ Λ

Strange hadrons are not different, but for mass effects.

And FFs based on e⁺e⁻ only, already failed for the inclusive case.

Summary

Scaled Momenta distributions were measured for strange hadrons in ep DIS.

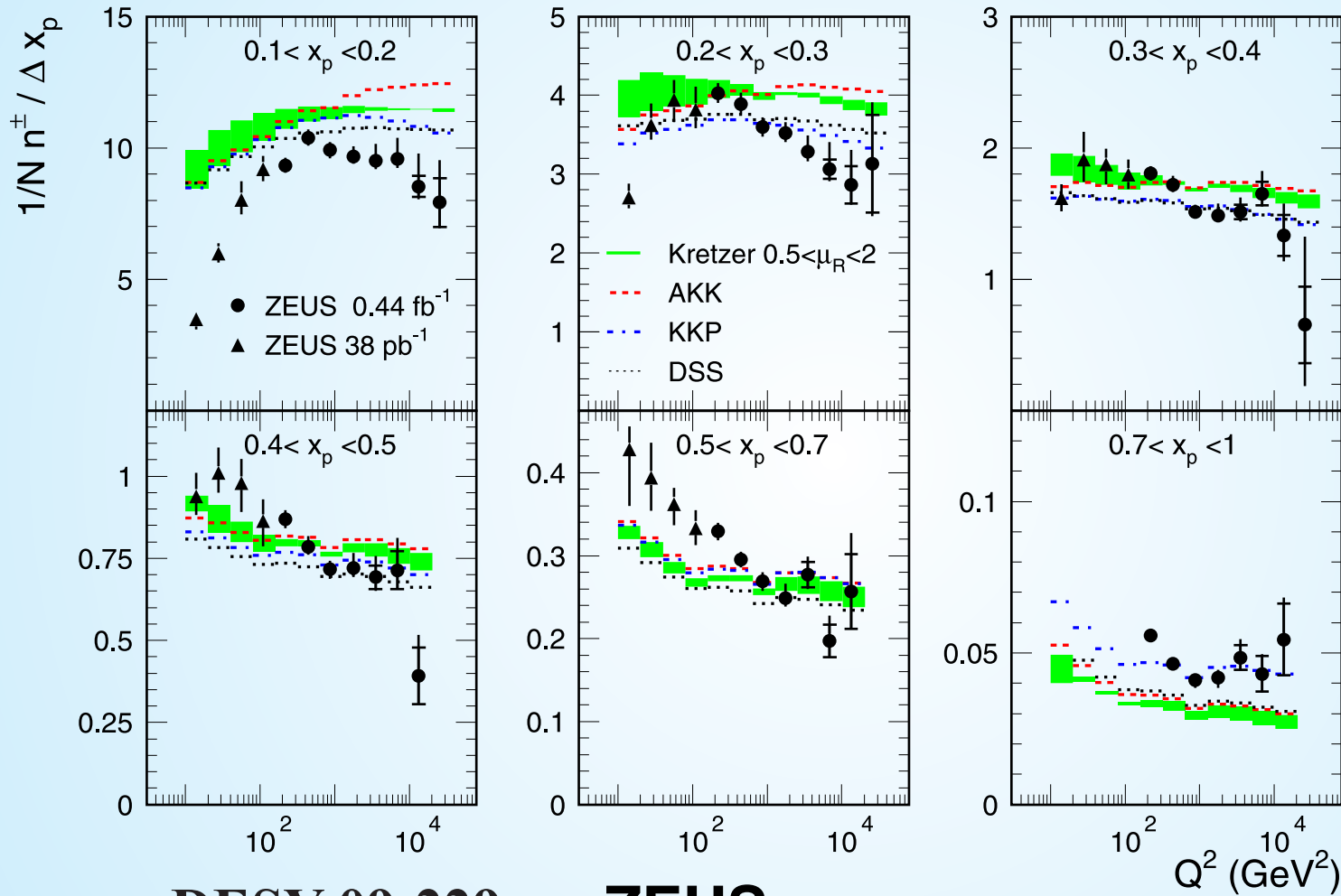


So far, the fragmentation functions were not constrained to describe strange hadron production... and they do not.

We hope the data are useful to further improve the fragmentation functions.



Scaled Momentum Distribution



DESY 09-229

ZEUS

Inclusive scaled momenta from charge tracks and various FF predictions