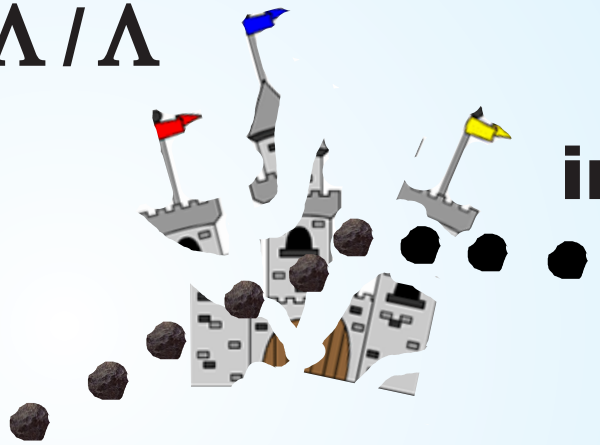
Scaled momentum distributions for

K^0_S and $\Lambda / \overline{\Lambda}$



in DIS

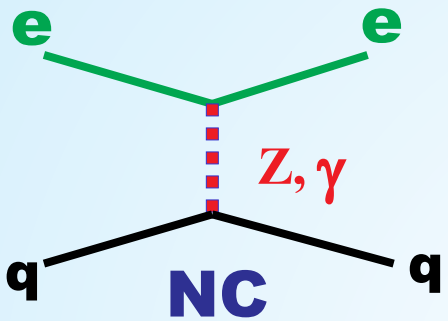
DESY 11-205

Why, How, What

Bonn 28.3.2012

I.Abt, MPI München

Motivation



NC partonic process

a miracle happens ← It is not just perturbative QCD

K^0_S

Λ

$\overline{\Lambda}$

strange hadrons

data to fit

Lund string model + leading log parton shower MC

or

fragmentation functions – leading – twist collinear factorisation

Predictions

Factorisation:

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

proton pdf

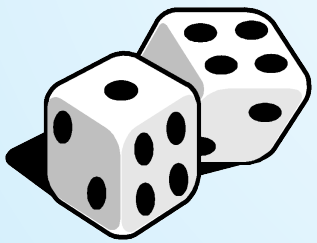
partonic cross section

Hadronisation Fragmentation Function

NLO QCD

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

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



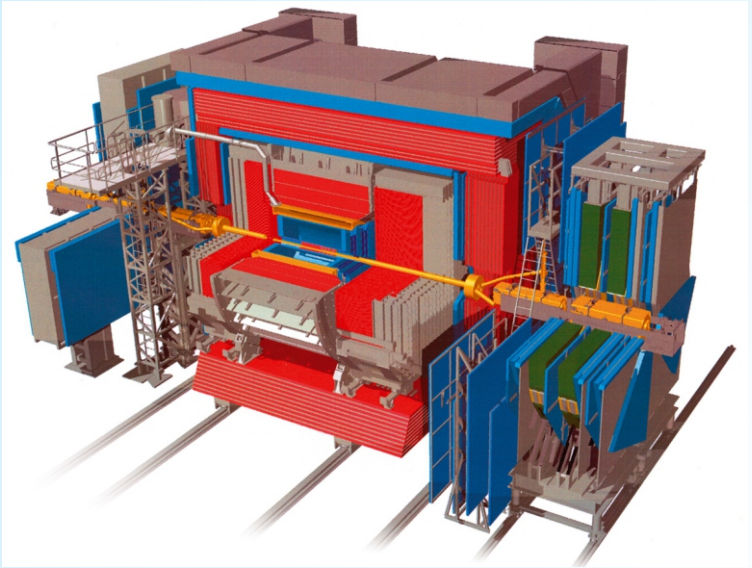
Monte Carlo: LEPTO

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^0_S and $\Lambda / \overline{\Lambda}$

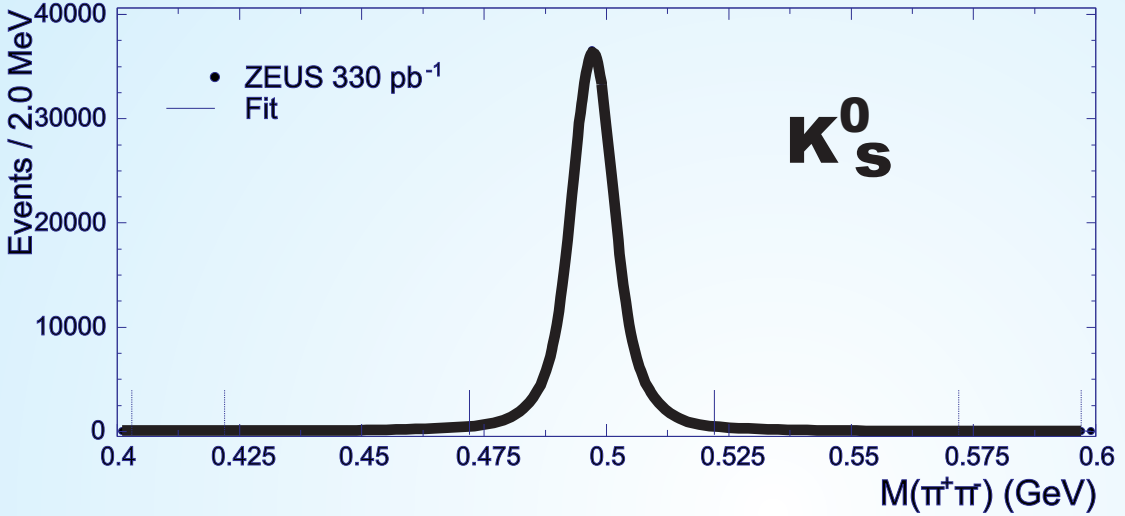
Details in DESY 11-205

$10 < Q^2 < 40000$ **$0.001 < x < 0.75$**

$x_p = 2\, P^{Breit} / \sqrt{Q^2}$ **$q=(0,0,-Q)$ Breit frame**

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

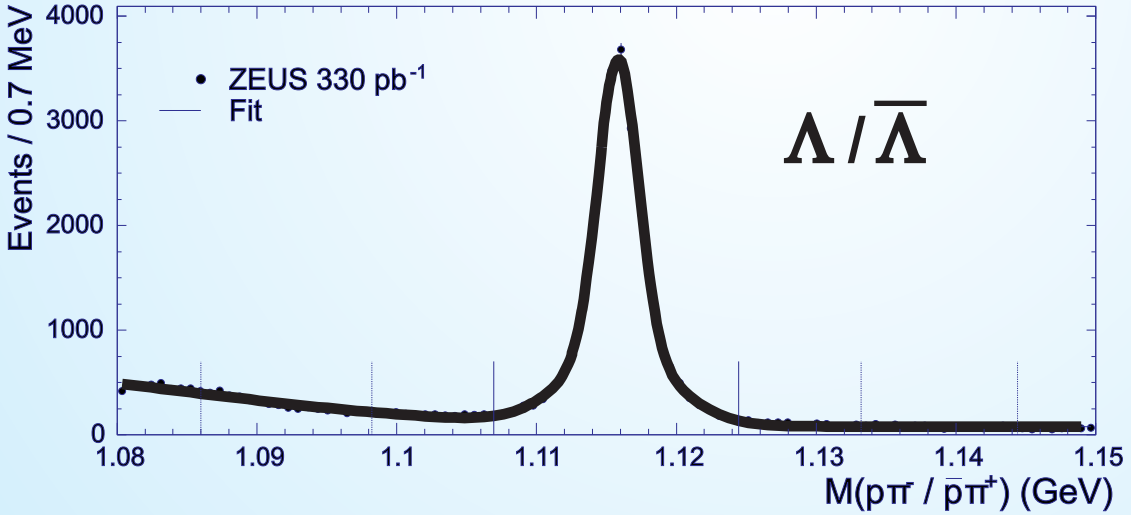
Signal



806505 events

→

238153 in current region of Breit frame

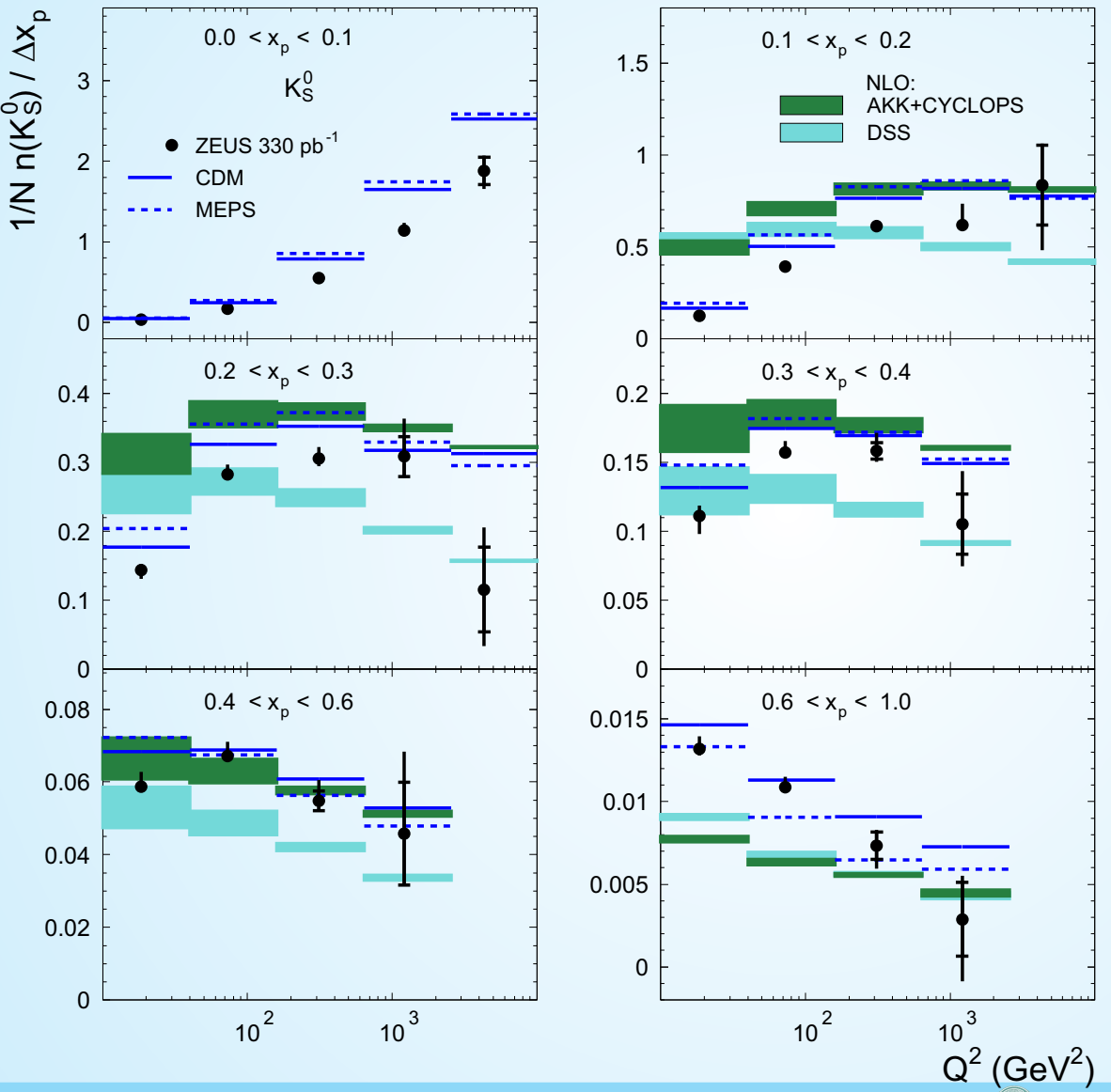


165875 events

→

40728

Scaled Momentum Distribution



K^0_S

scaling violation: Q increases

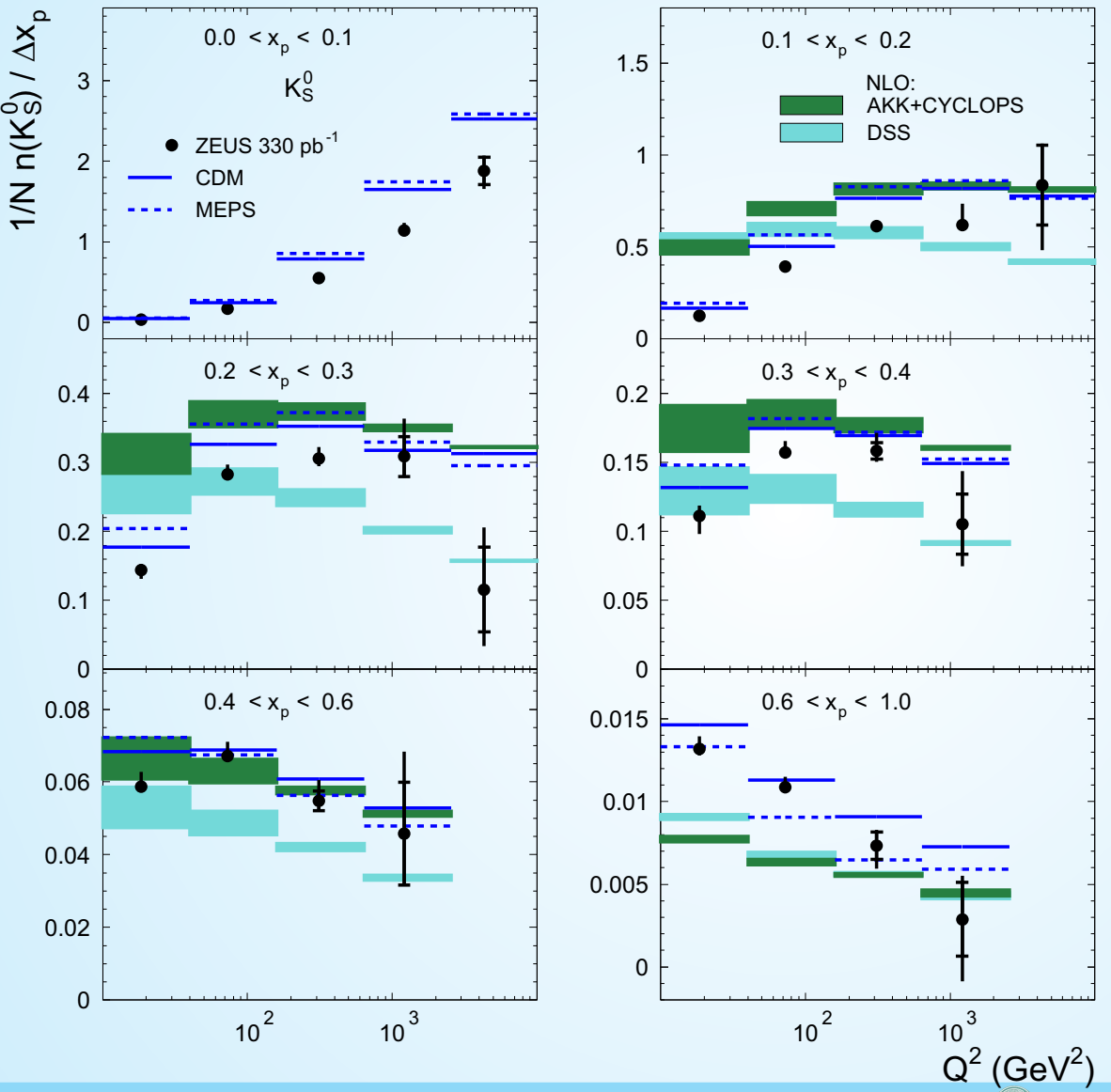
⇒

more soft gluon radiation

⇒

more particles with low x_p

Scaled Momentum Distribution



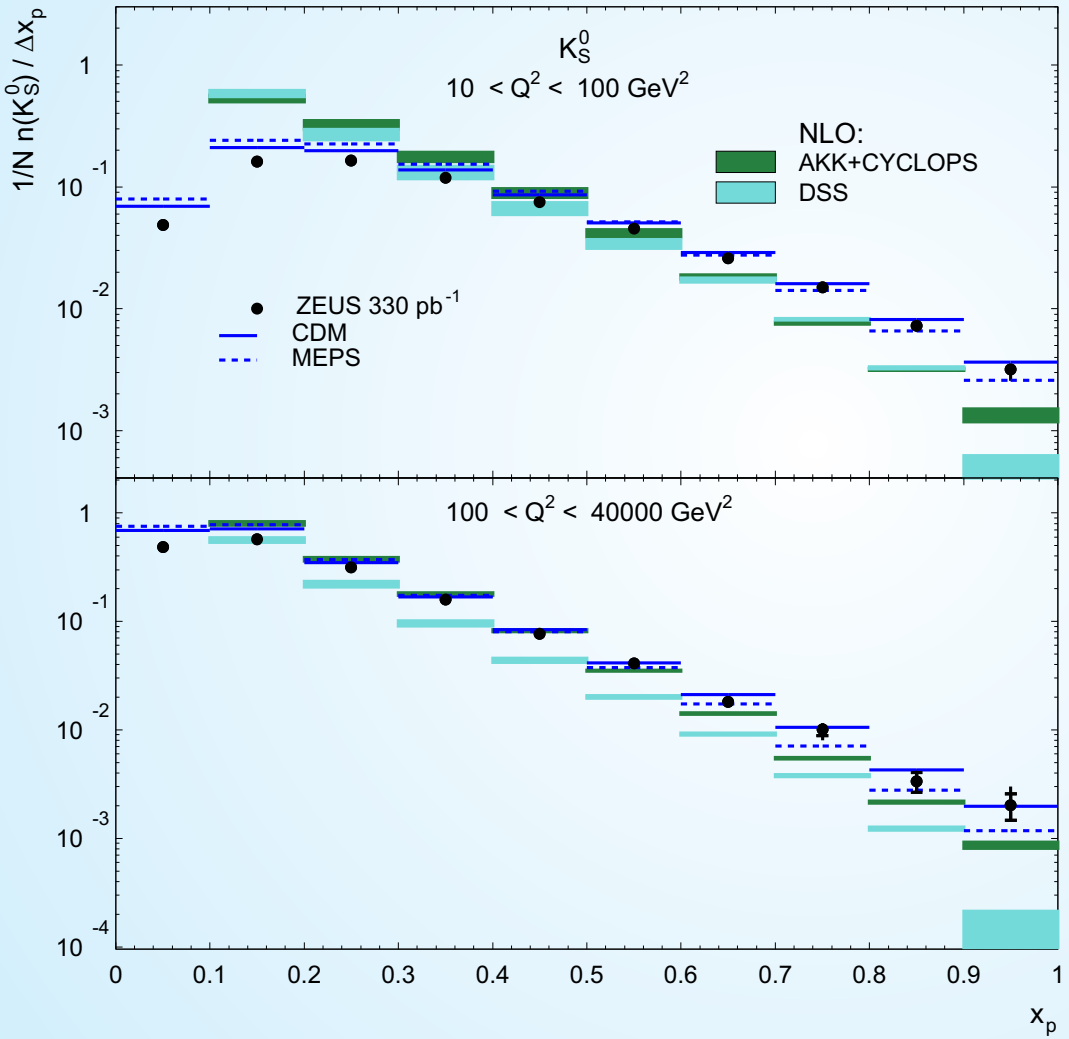
K^0_S

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

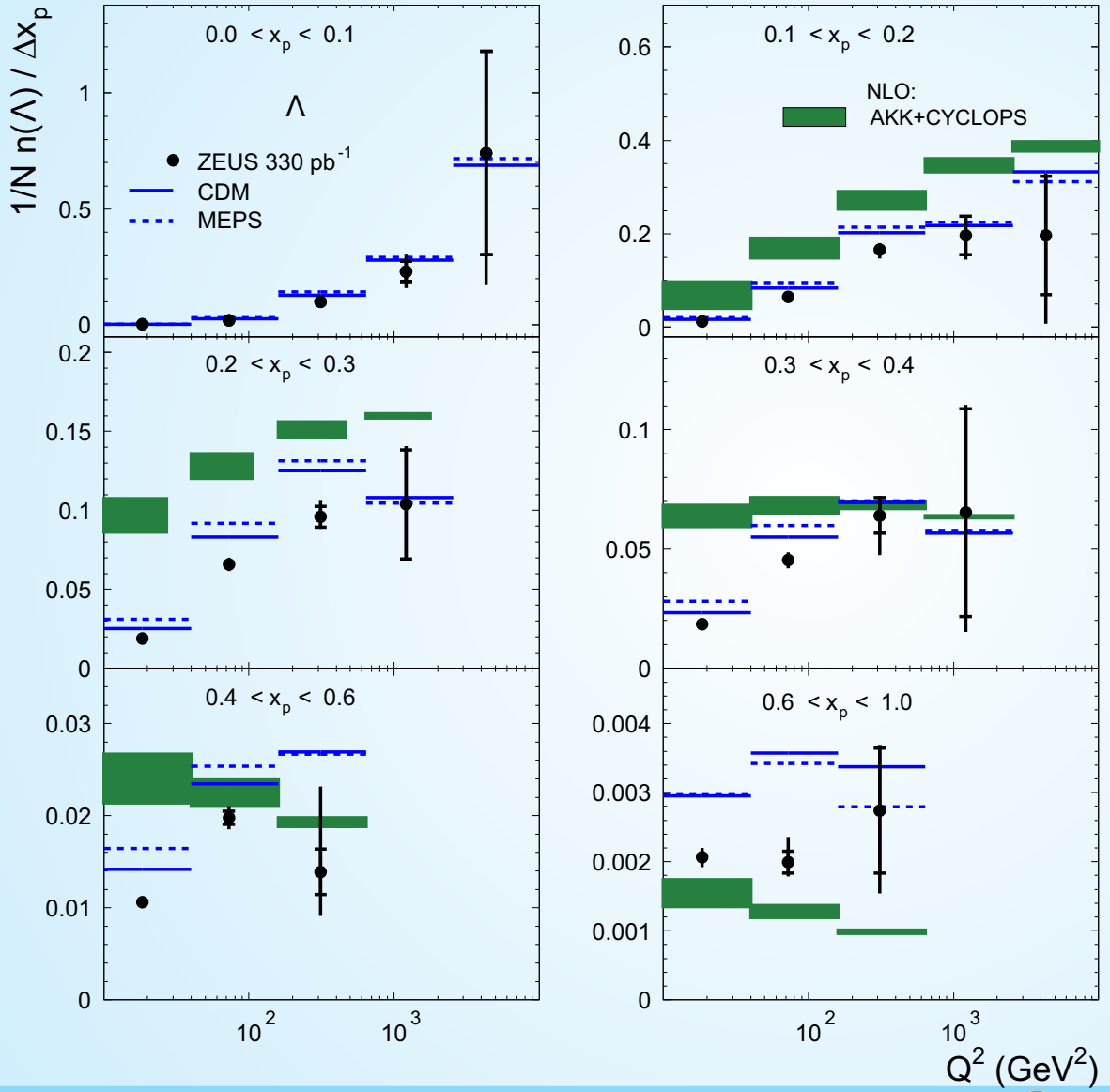


K^0_S

Fragmentation Functions predict too steep spectra.

They just had not enough previous input.

Scaled Momentum Distribution



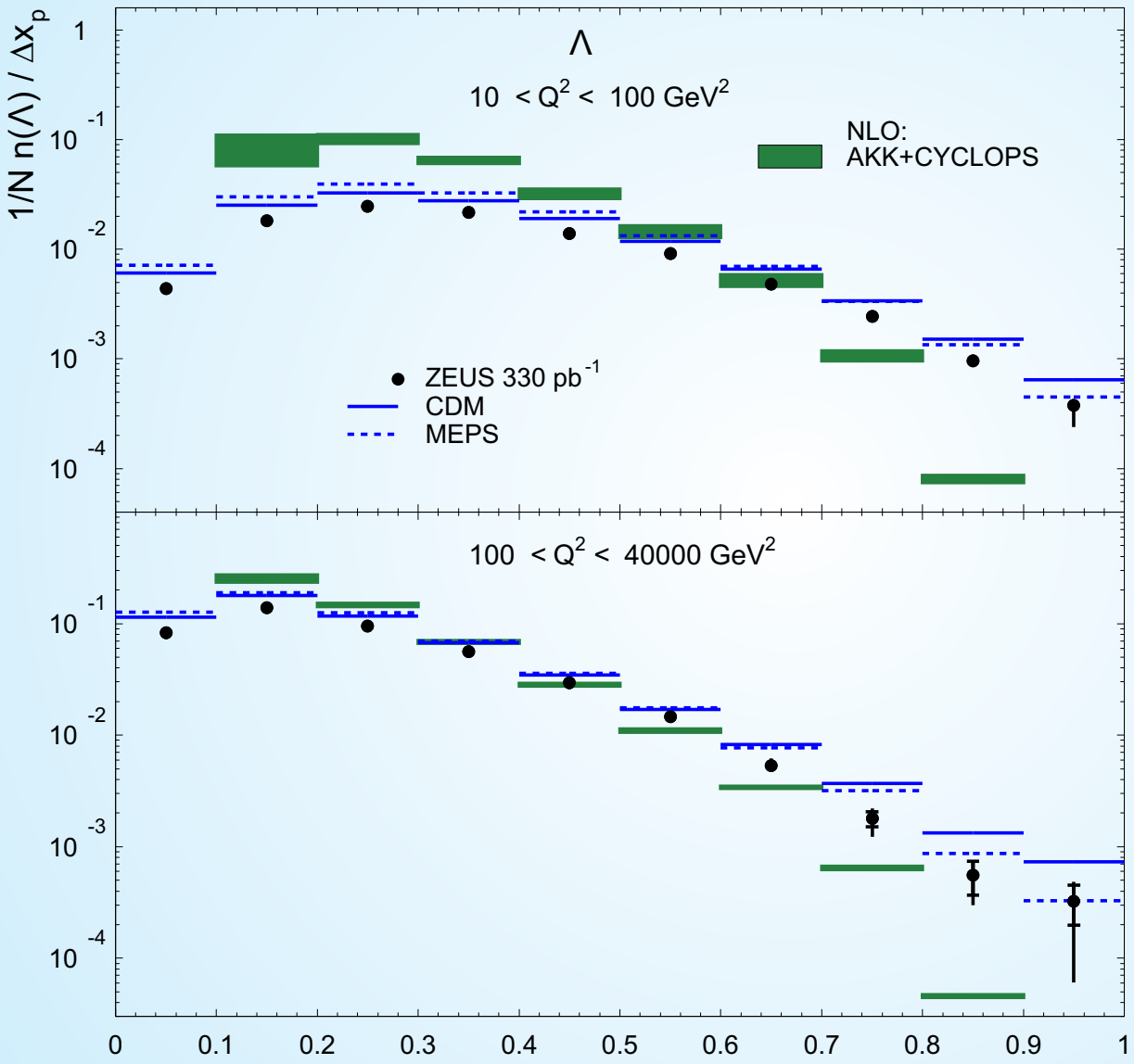
$\Lambda / \overline{\Lambda}$

again: scaling violations

MC are still reasonable

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

Scaled Momentum Distribution

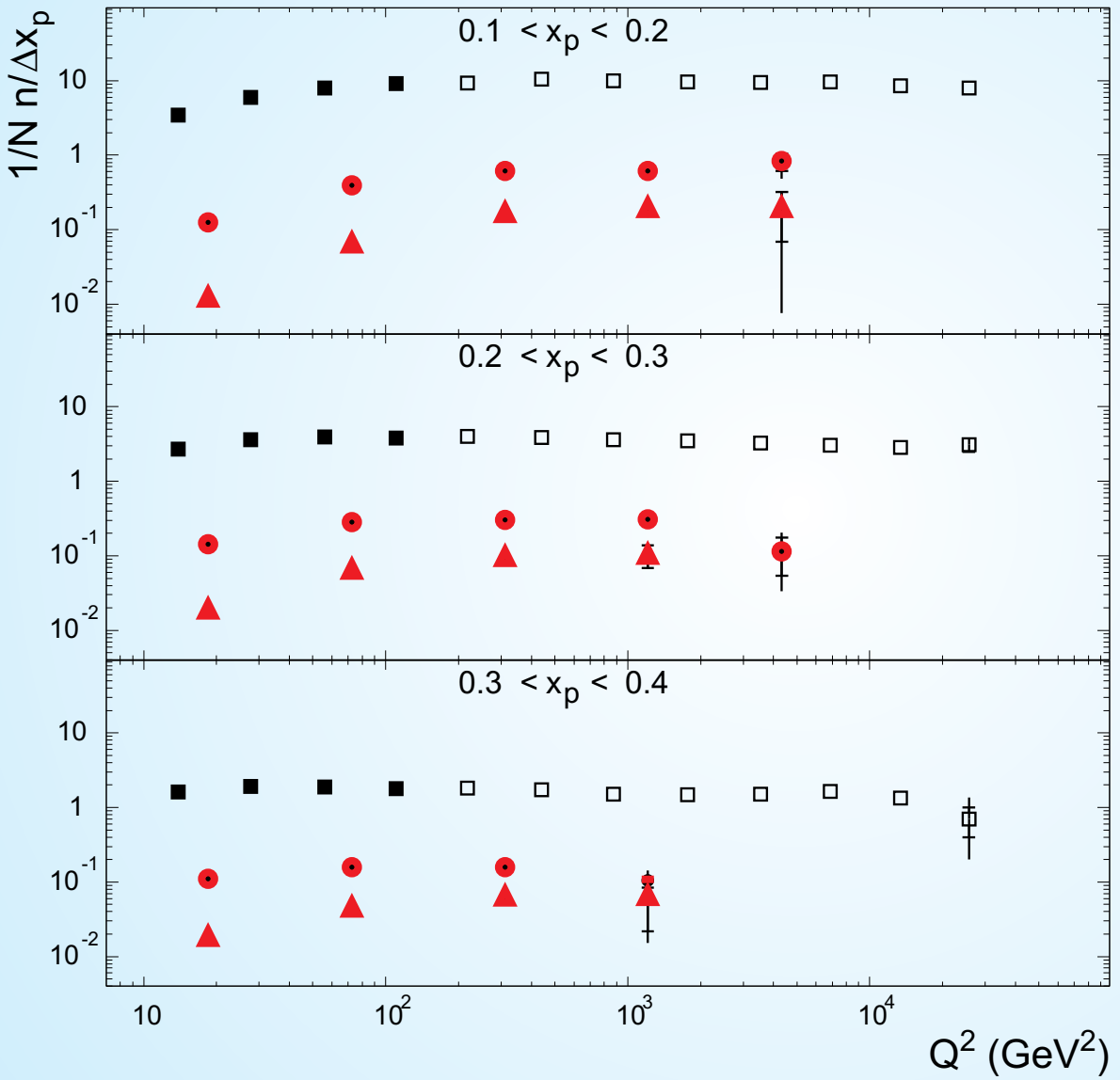


$\Lambda / \overline{\Lambda}$

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^0_S 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

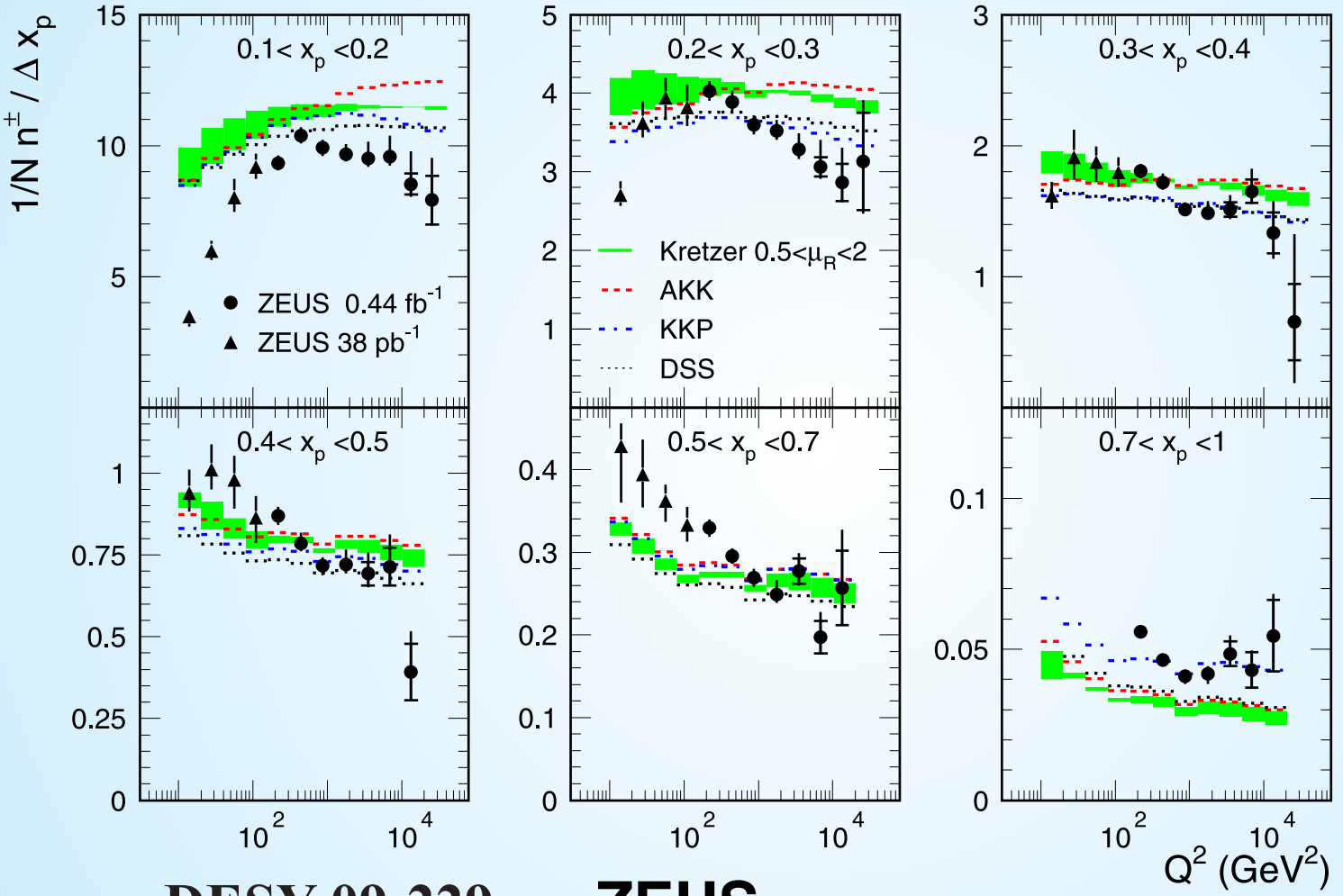
Scaled Momenta distributions were measured for strange hadrons in ep DIS.

K^0_S $\Lambda / \overline{\Lambda}$

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