Strangeness production at High Q^2 at H1

DIS Workshop 2010

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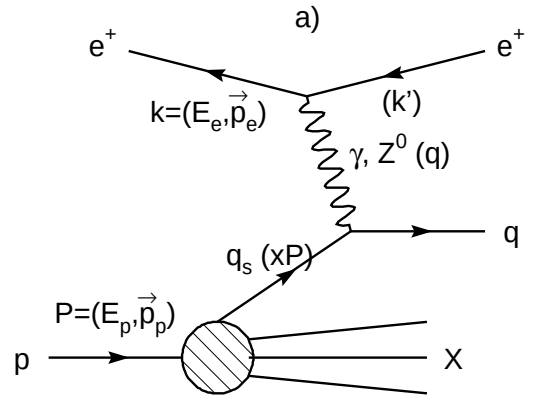
On behalf of H1 Collaboration

- Introduction
- Measurements: K_s^0 , $K_s^0/h^{\pm}$,K_s^0/DIS
- Summary

HERA collider and H1 detector

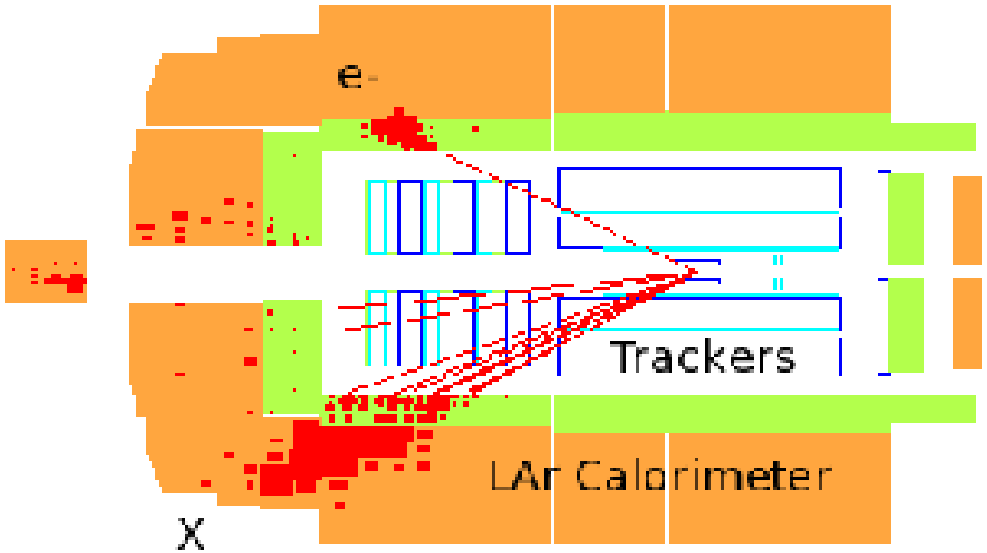


$$Q^2 = -q^2 = (k - k')^2,$$
$$y = \frac{q \cdot P}{k \cdot P}, \quad x_{Bj} = \frac{Q^2}{2q \cdot P}$$

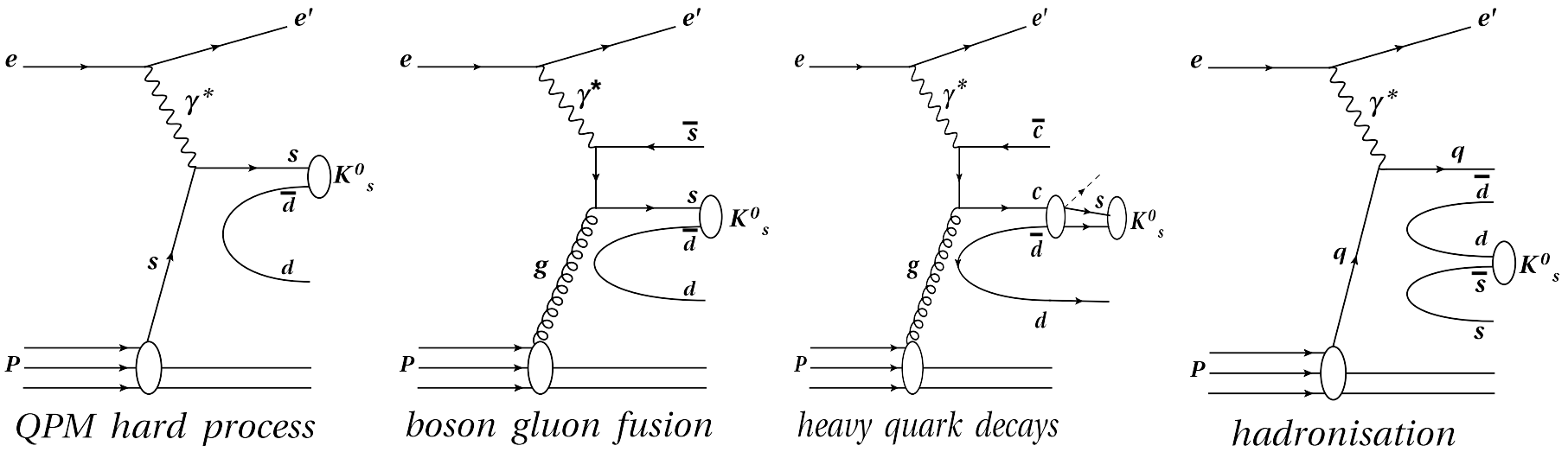
The collider provides:

- $E_e = 27.6$ GeV
- $E_p = 920$ GeV

$$\sqrt{s} = P + k = 319 \text{ GeV}$$

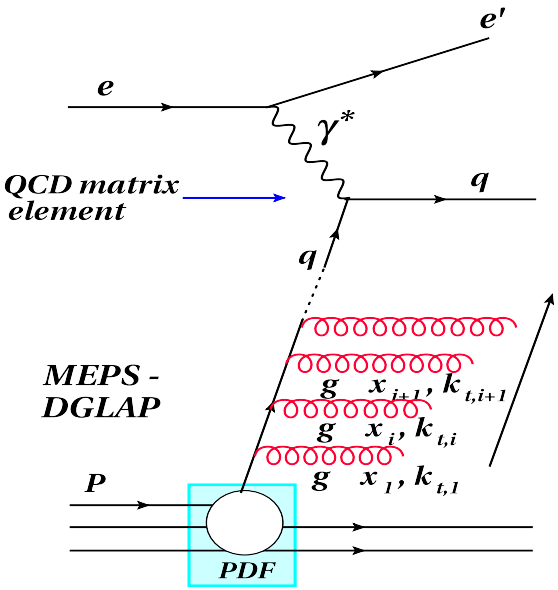


Strange production mechanism



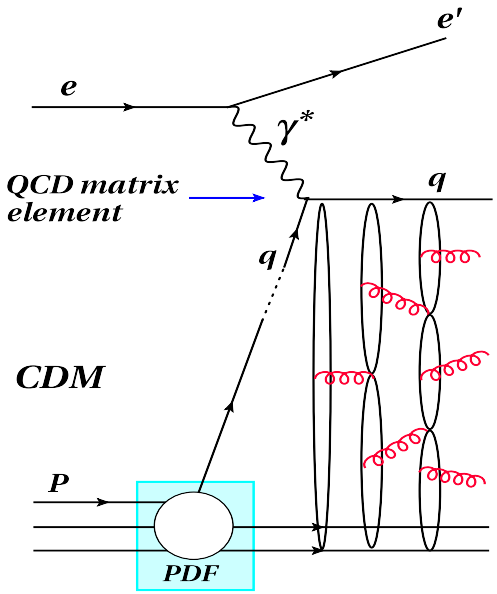
* At high Q^2 all mechanisms contribute significantly.
* Test of models of fragmentation/hadronisation.
* Optimisation of the Monte Carlo parameters.
* Test of λ_s universality.

Simulation programs



Parton Showers - Rapgap

MEPS: DGLAP evolution equation, strong k_T ordering for gluon emission.
CDM: independent radiation, no ordering in k_T.



Color Dipole Model - Django

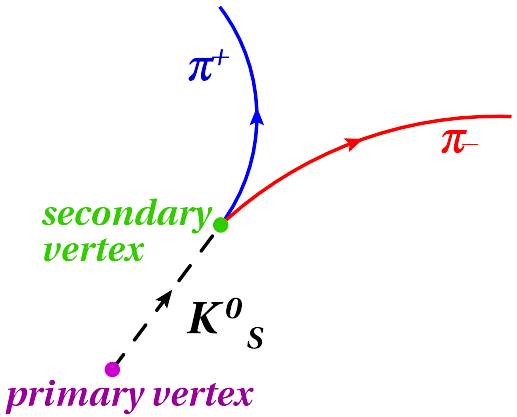
Interfaced to Lund string fragmentation

- strangeness suppression factor $\lambda_s = P(s)/P(q)$
- diquark suppression factor $\lambda_{qq} = P(qq)/P(q)$
- strange diquark suppression factor $\lambda_{sq} = (P(sq)/P(qq))/\lambda_s$
- e^+e^- ALEPH tuning:$\lambda_s = 0.286$, $\lambda_{qq} = 0.108$, $\lambda_{sq} = 0.690$

The K_s^0 identification

The decay channel considered is:

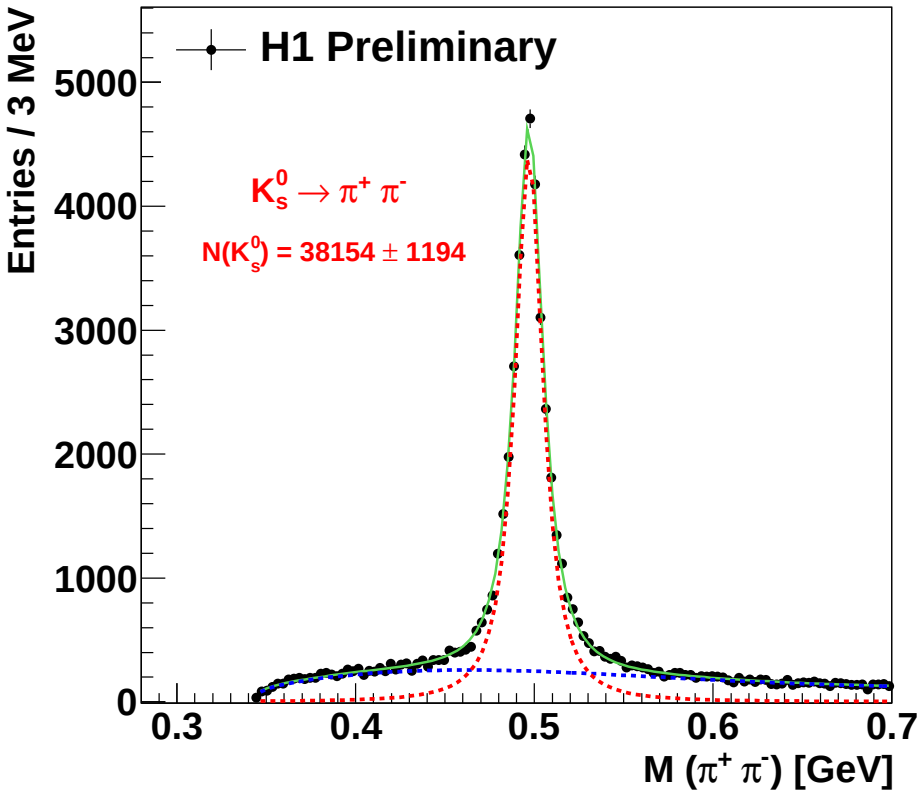
$K_s^0 \rightarrow \pi^+\pi^-$ with $BR \sim 69.2\%$



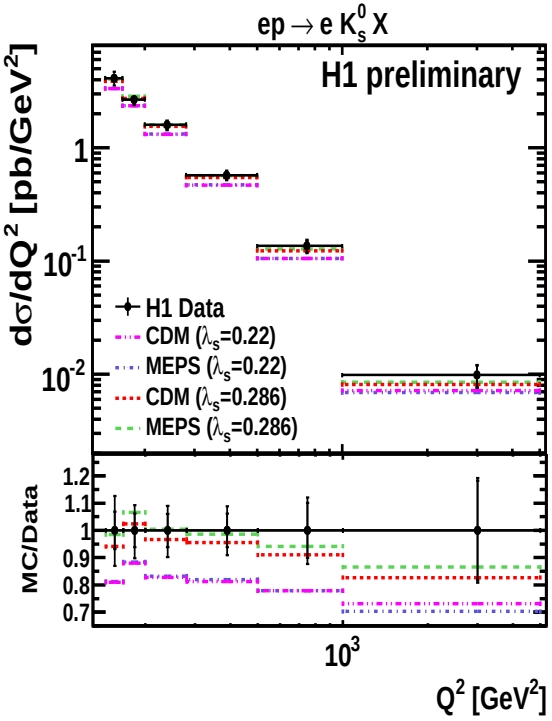
For the measurement:

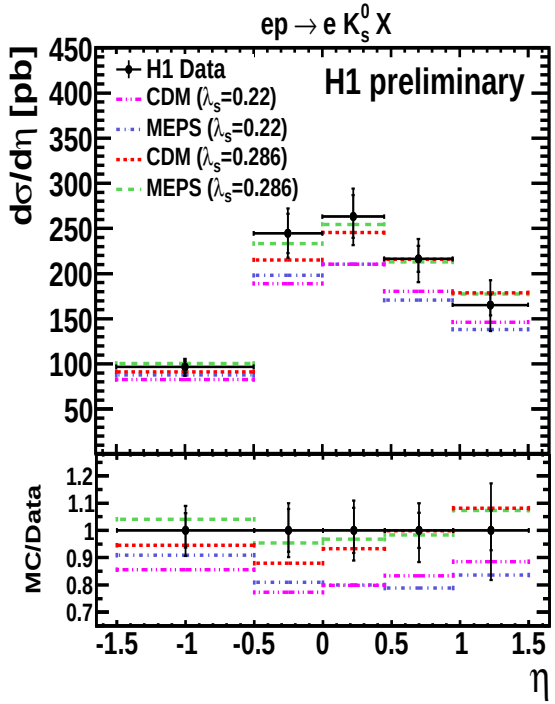
- $145 < Q^2 < 20000\ GeV^2$
- $0.2 < y_e < 0.6$
- $p_T(K_s^0) > 0.3\ GeV$
- $-1.5 < \eta(K_s^0) < 1.5$

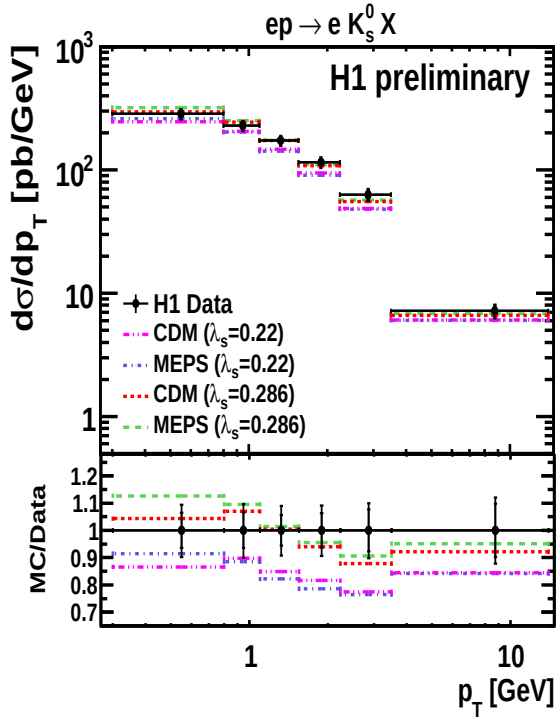
38154 K_s^0 candidates found in $\mathcal{L} = 340\ pb^{-1}$



Cross section measurement in laboratory frame



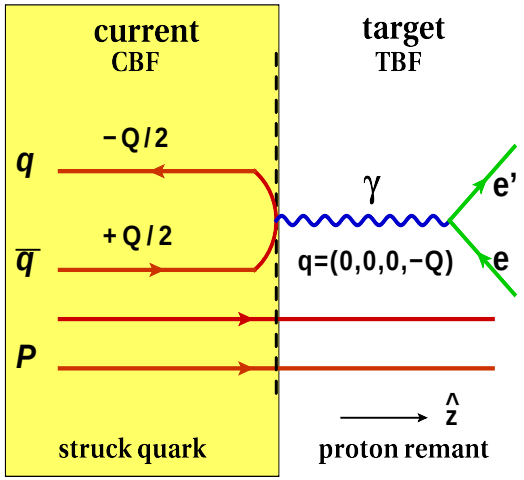




$$\sigma_{vis} = 531 \pm 17(\text{stat.})^{+37}_{-39}(\text{syst.})pb$$

- λ_s =0.286 agrees with data in shape and normalization.
- MEPS and CDM give similar description of the data.

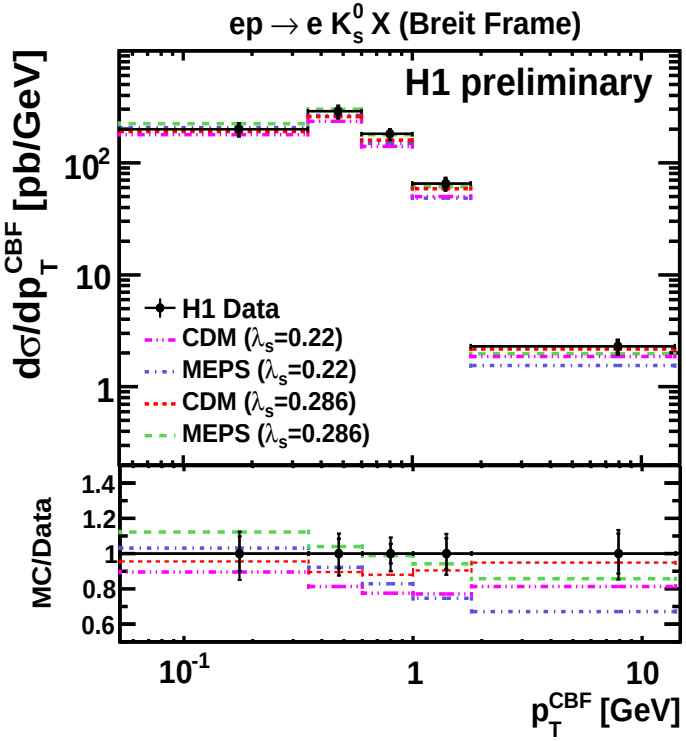
Cross section in Breit frame - Current region

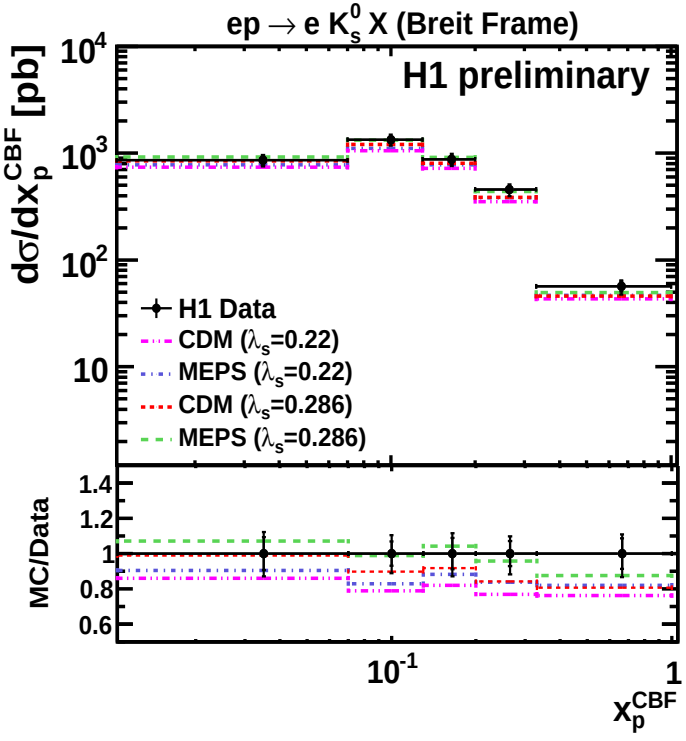


p_T^{CBF} respect to $\hat{z}$

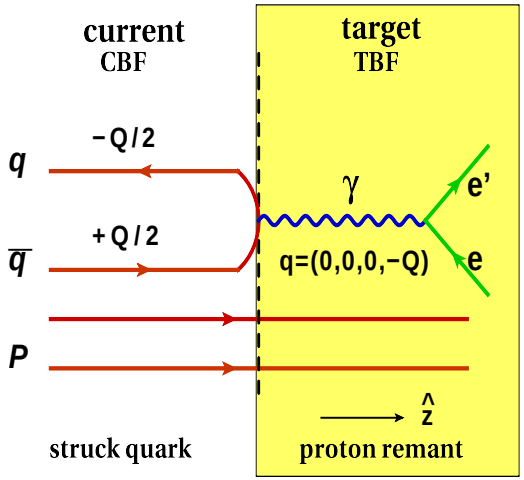
$x_p^{CBF} = \frac{2P_T^{CBF}}{Q}$

* Analogy to e^+e^- collisions.
* QPM hard process preferentially.
* Better agreement with λ_s =0.286.





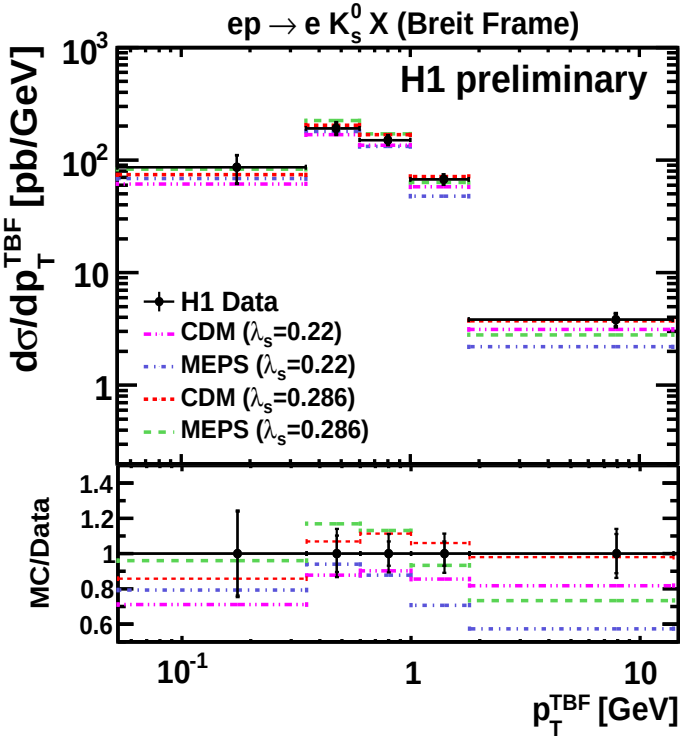
Cross section in Breit frame - Target region

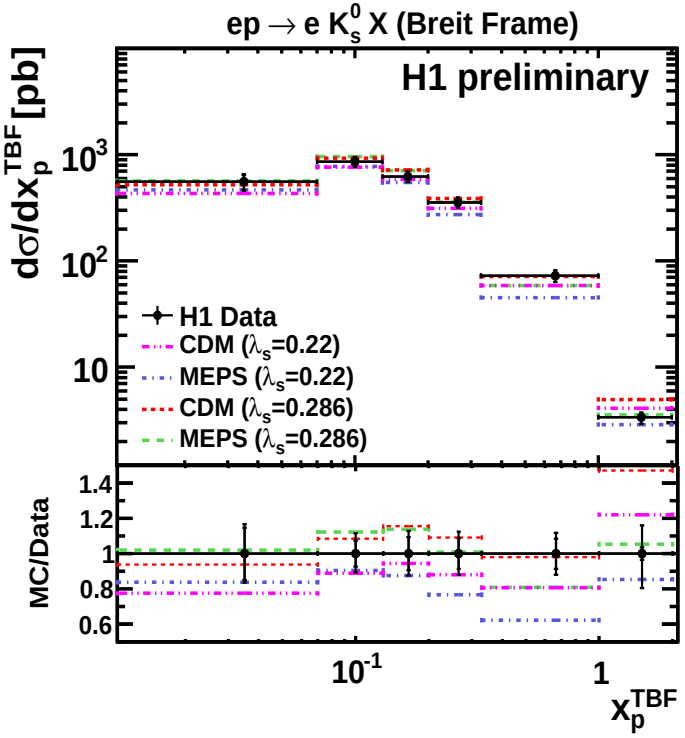


p_T^{TBF} respect to $\hat{z}$

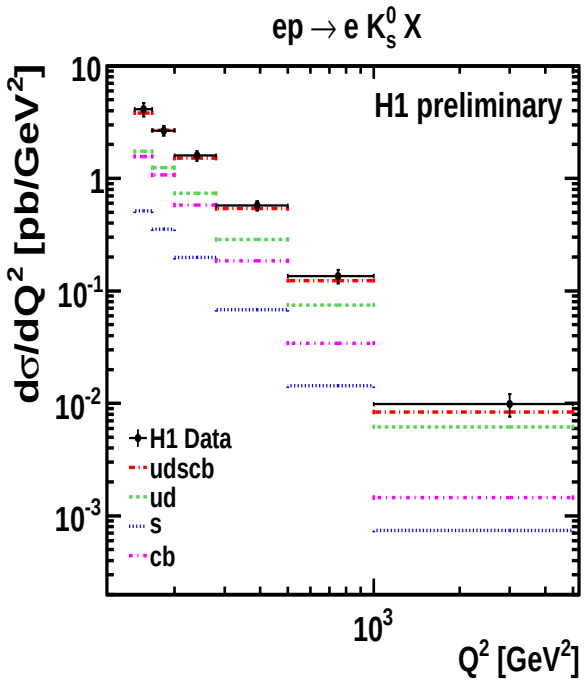
$x_p^{TBF} = \frac{2P_T^{TBF}}{Q}$

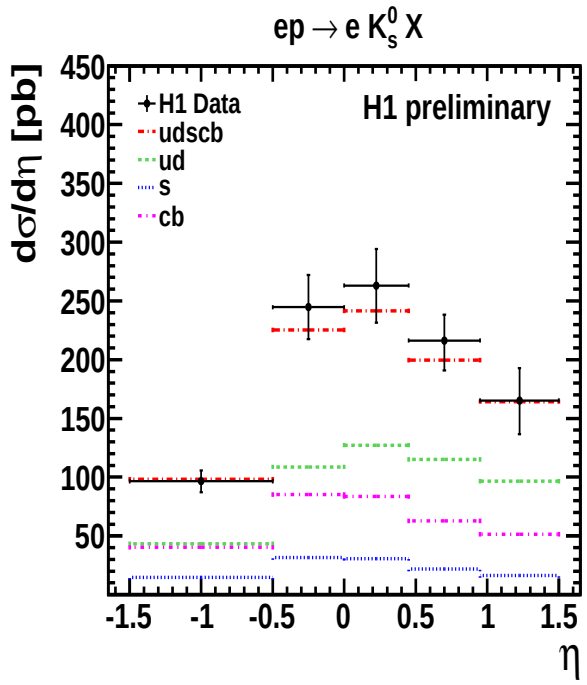
* Hadronisation process predominantly.
* More sensitivity to λ_s.

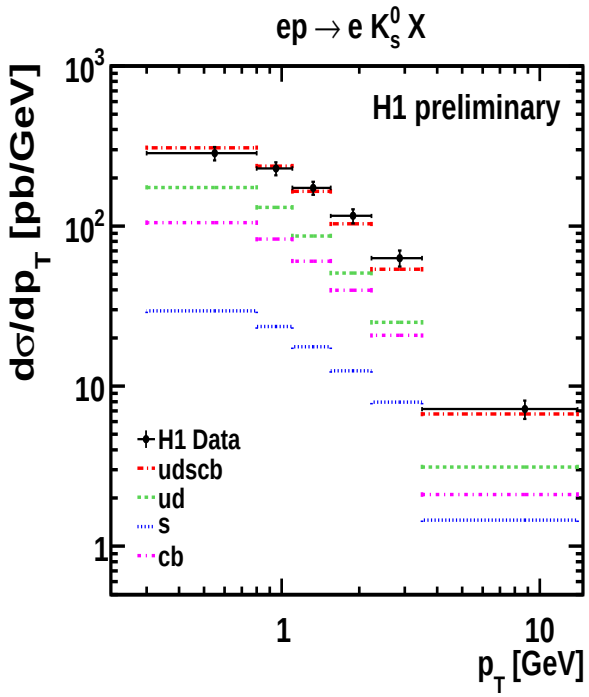




Flavour contribution in laboratory frame



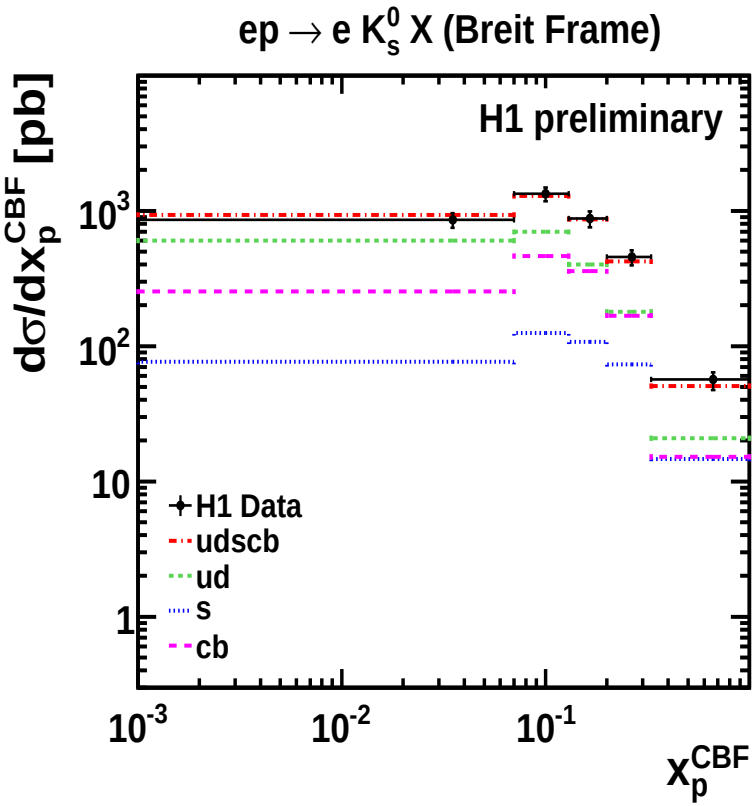


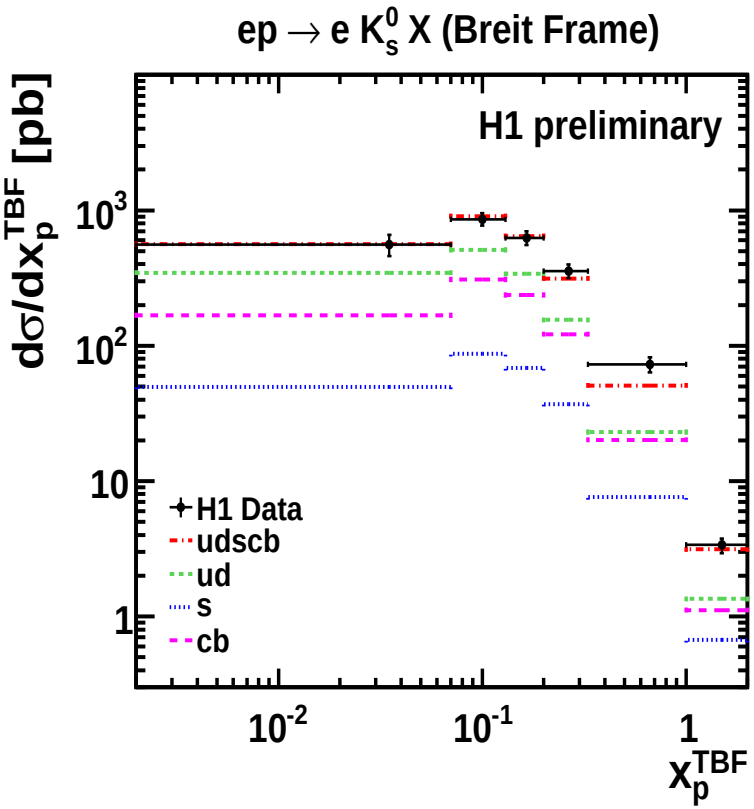


- The contribution of *ud* light quarks dominates.
- Heavy *cb* quarks as second dominant contribution.
- The *s* quark contribution becomes more important at high p_T.

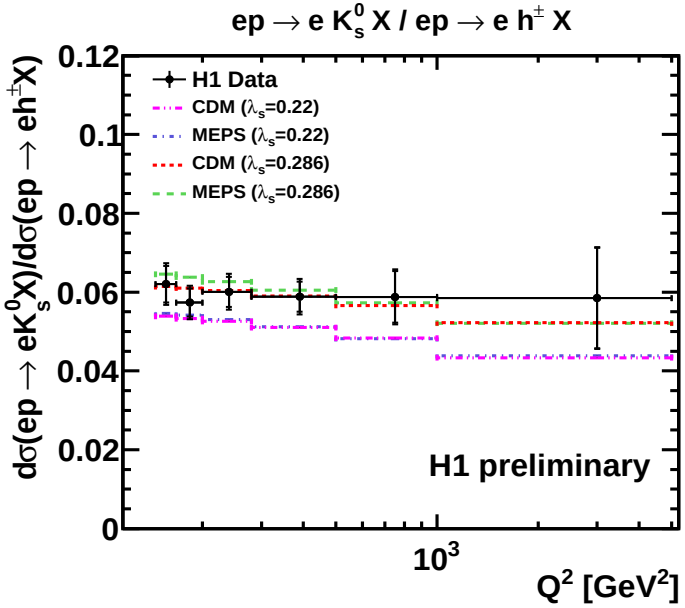
Flavour contribution in Breit frame

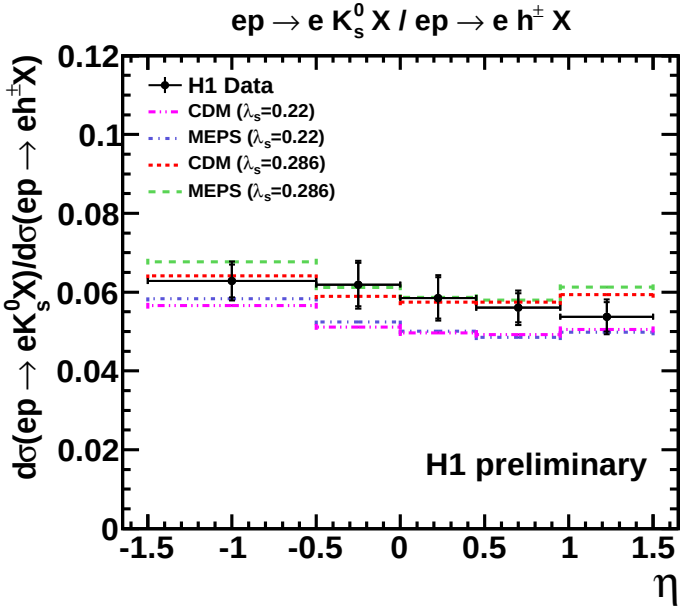
- The contribution of s quark equals the heavy cb quarks contribution at high x_p in current region.

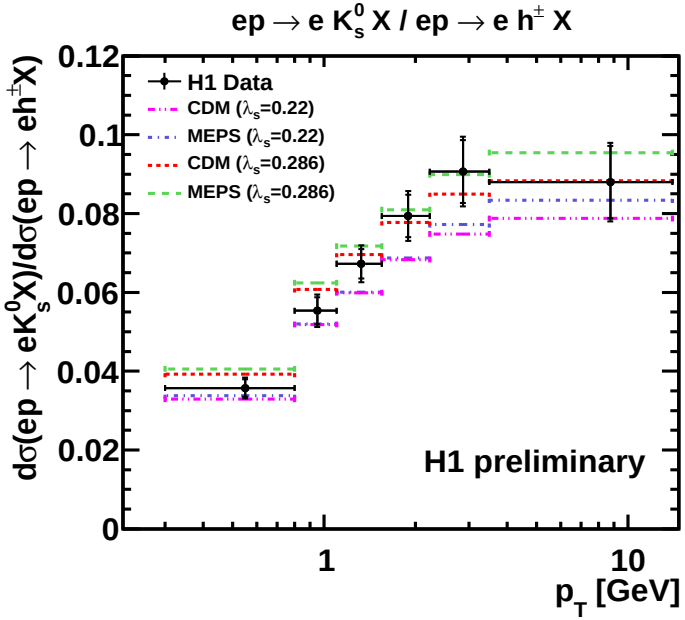




The ratio of K_s^0 over charged particle production



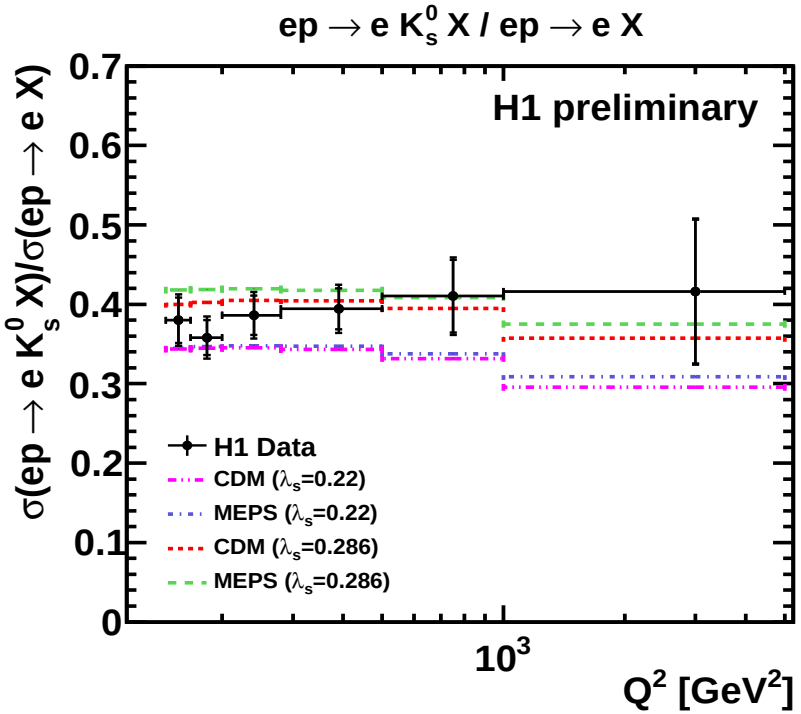


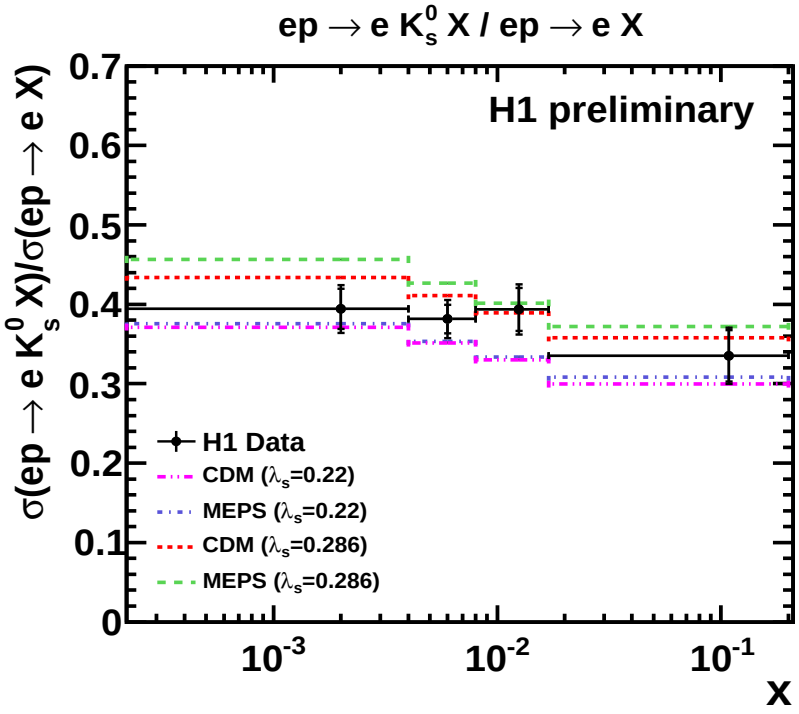


$$\sigma(ep \to eK_s^0 X)/\sigma(ep \to eh^{\pm} X)$$

- Ratio almost flat as function of Q^2.
- Ratio rises in p_T.
- λ_s =0.286 describes data.

The K_s^0 density measurement





$$\text{Density} = \sigma(ep \to eK_s^0 X)/\sigma(ep \to eX)$$

* The density average at 0.4 independently of Q^2 and x.
* Both models predict small falling in x.

- The K_s^0 production is measured as first time at high Q^2 by H1 collaboration.
- Production ratio of K_s^0 over charged particle and K_s^0 to DIS events give flat behavior.
- The production is dominated by hadronisation.
- The λ_s =0.286 describes the measurements.