

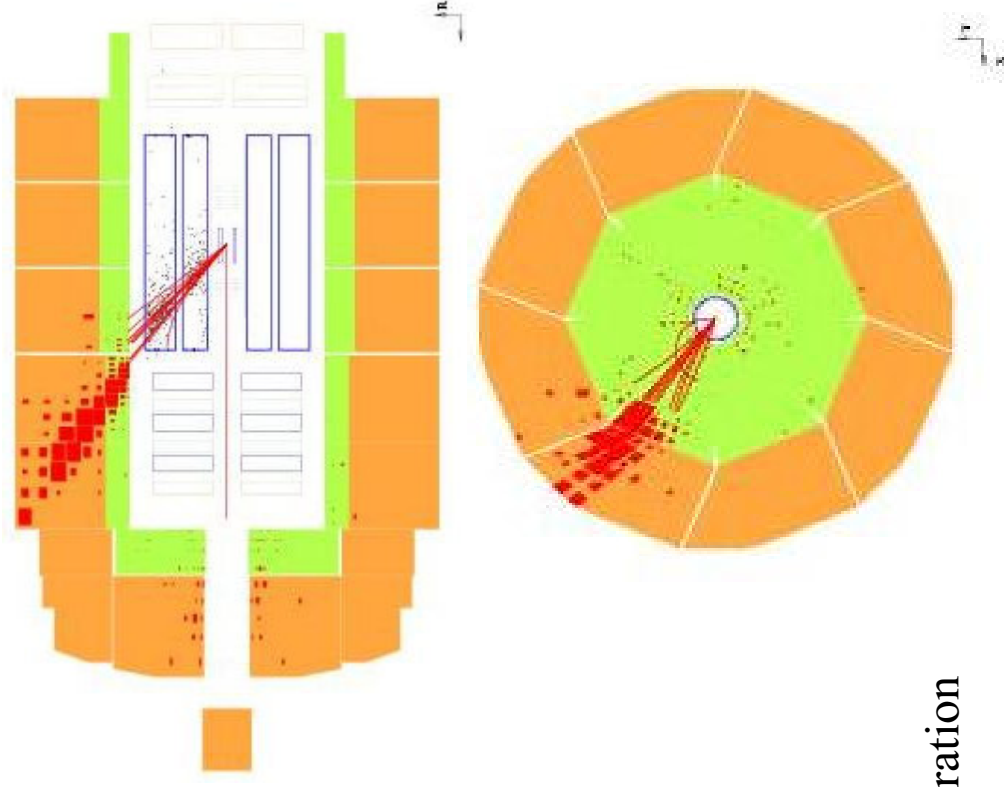
# New Results from H1

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From Strbske Pleso to Madison:

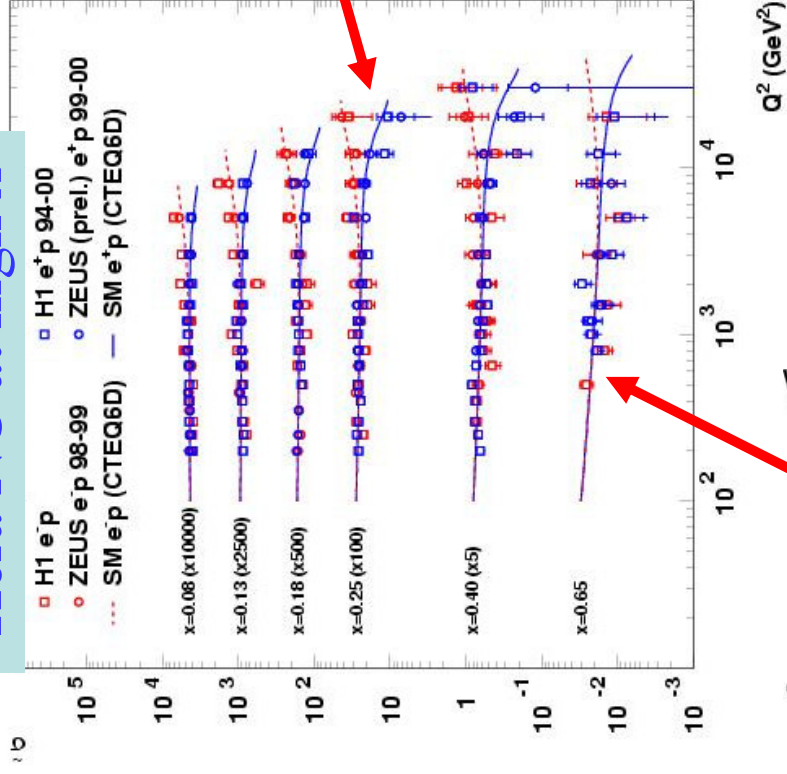
- Electroweak parameters
- $F_2^{cc}$  and  $F_2^{bb}$
- QCD tests with final states
- Searches
- Results with 2004/5 data
- Summary

2005' event

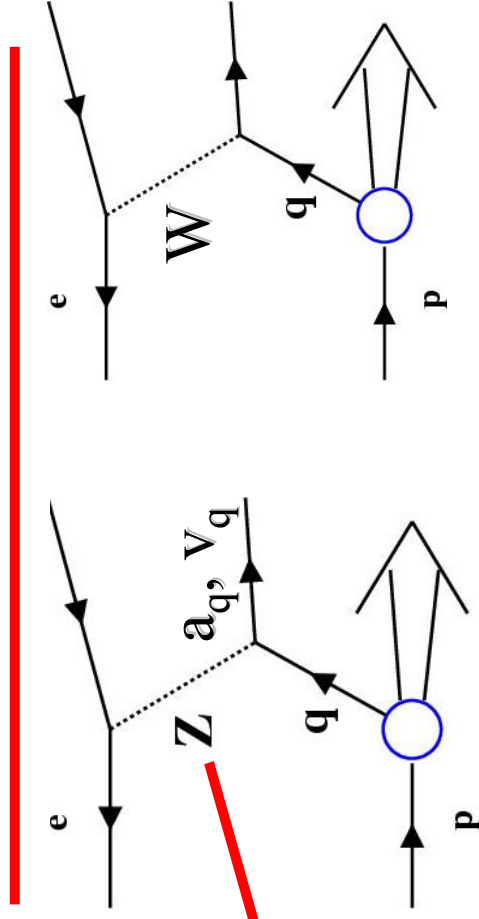


Olaf Behnke (Heidelberg) for the H1 collaboration

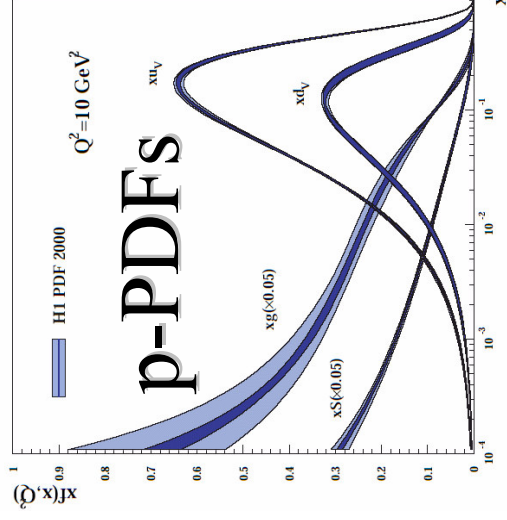
# Hera NC at high x



# Fit of el.weak parameters



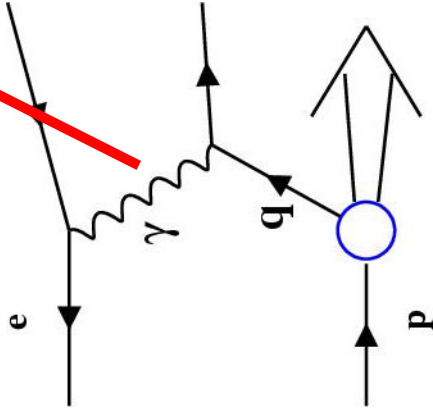
Ingredients for SM description:



EI. Weak

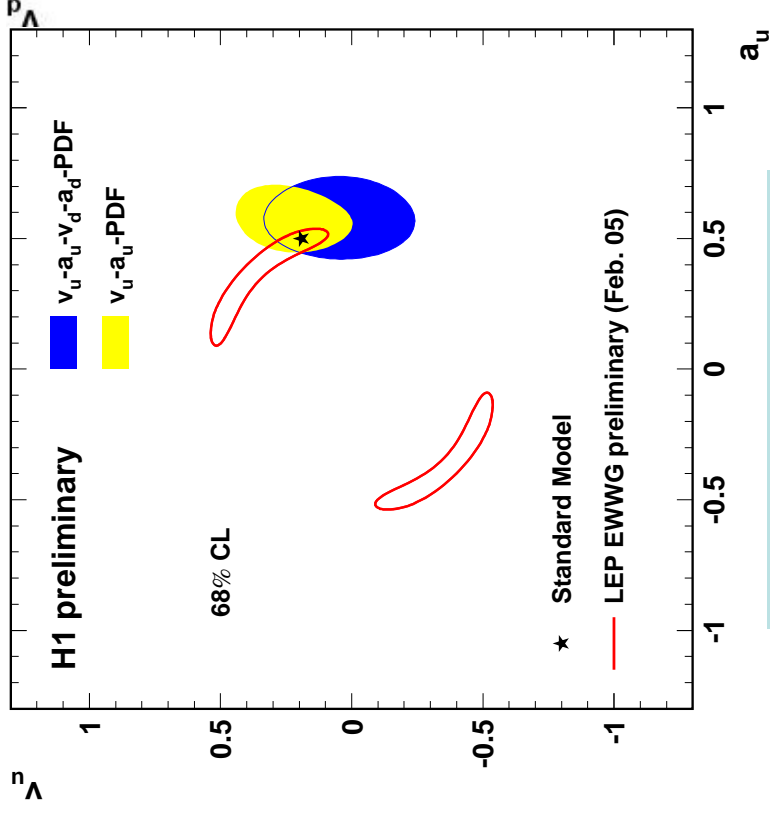
par.:  $a_q, V_q,$

...

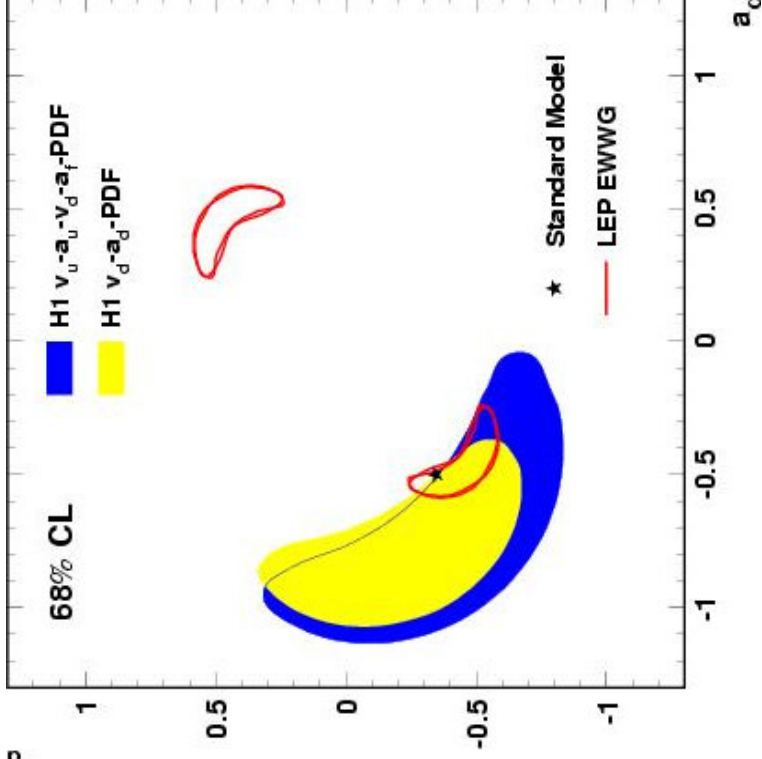


Perform combined fit of el. weak par. and p-pdfs

# Fit of electroweak parameters:



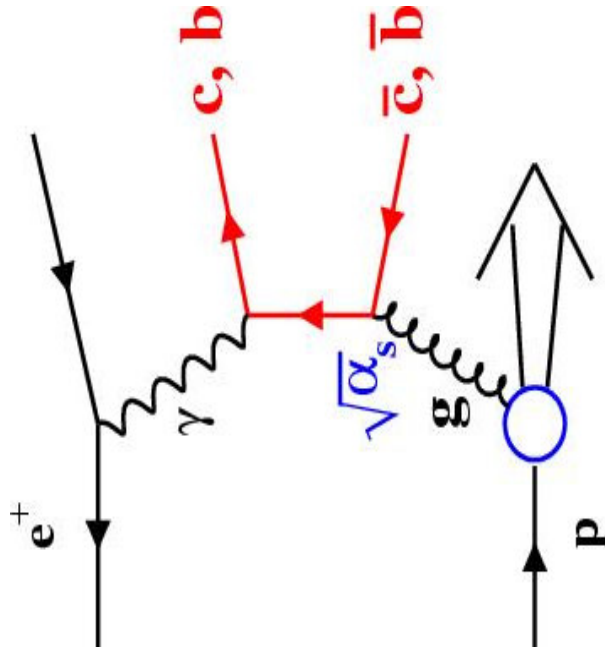
First HERA results on  $a_q, v_q$



Further results:

- $M_{\text{prop}} = 82.87 \pm 1.83 \text{ GeV [exp]}$
- $\sin^2\theta_w = 0.2151 \pm 0.0040 \text{ [exp]}$
- $M_{\text{top}} = 108 \pm 44 \text{ GeV}$

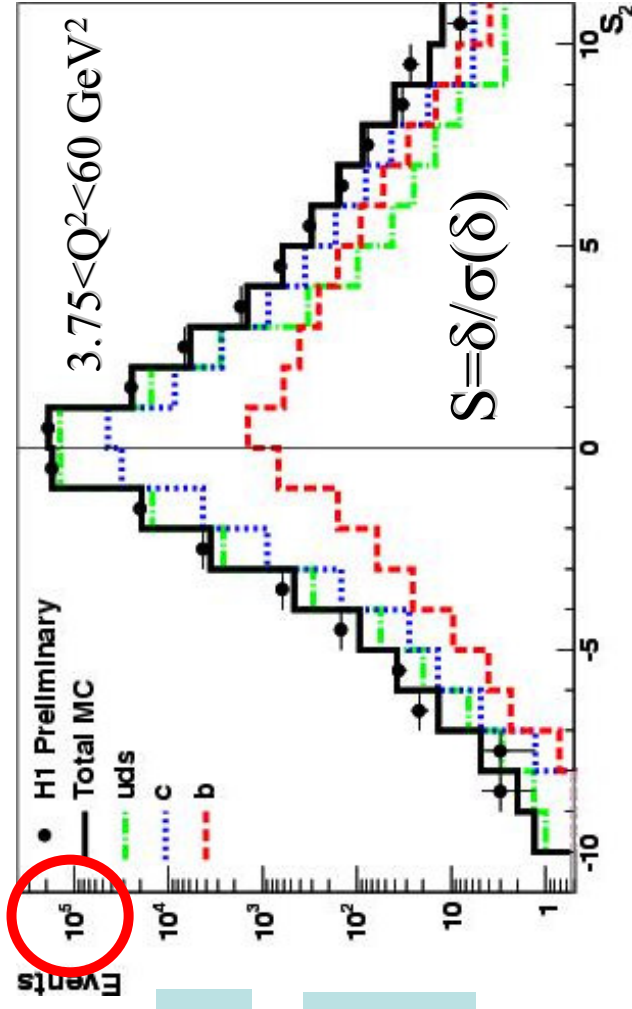
# New determination of $F_2^{cc}$ and $F_2^{bb}$



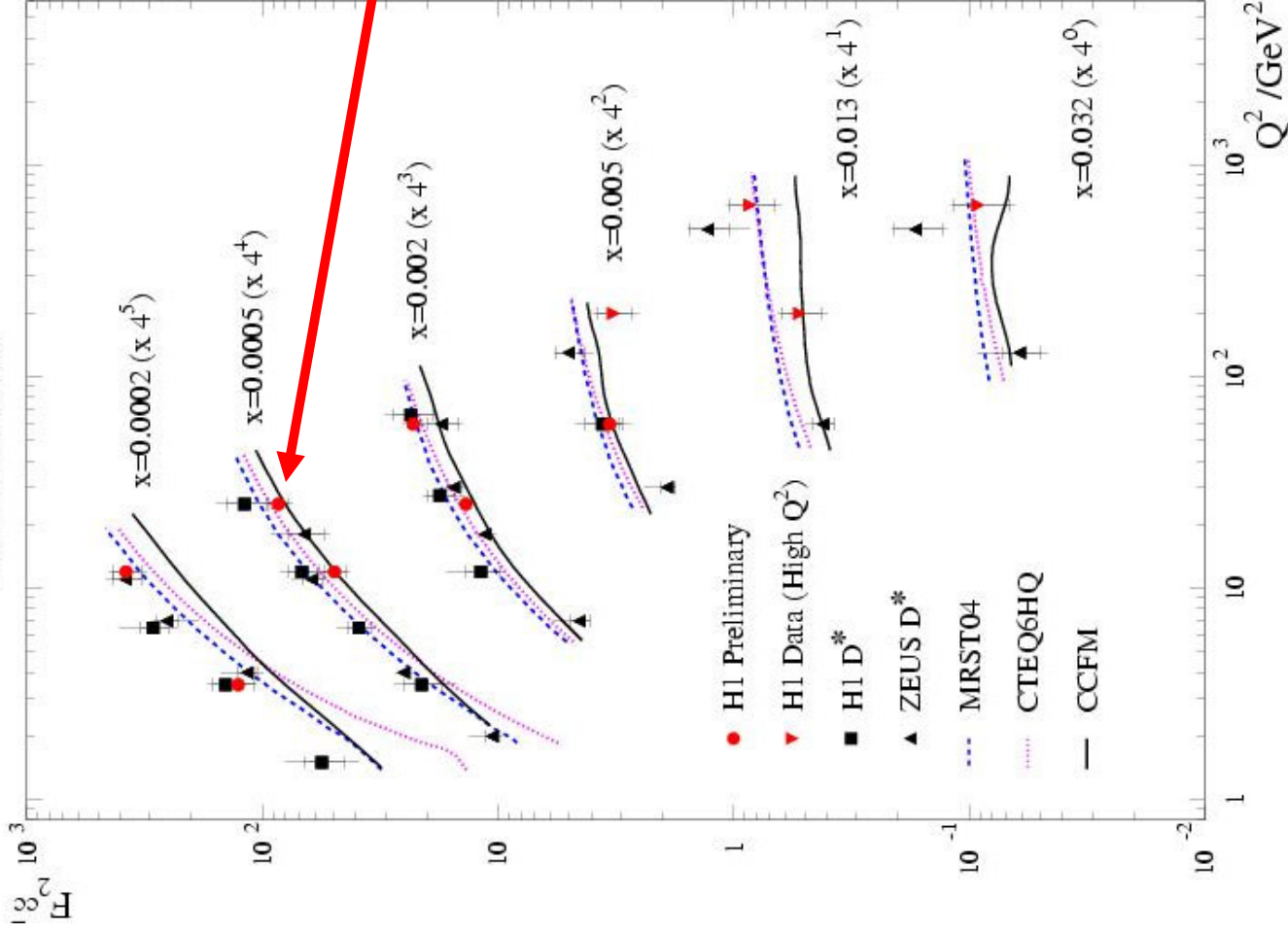
Measure c and b contributions to the inclusive ep-scattering

Exploit long b and c lifetimes

Use track impact parameters meas. with the H1 vertex det.



H1 PRELIMINARY



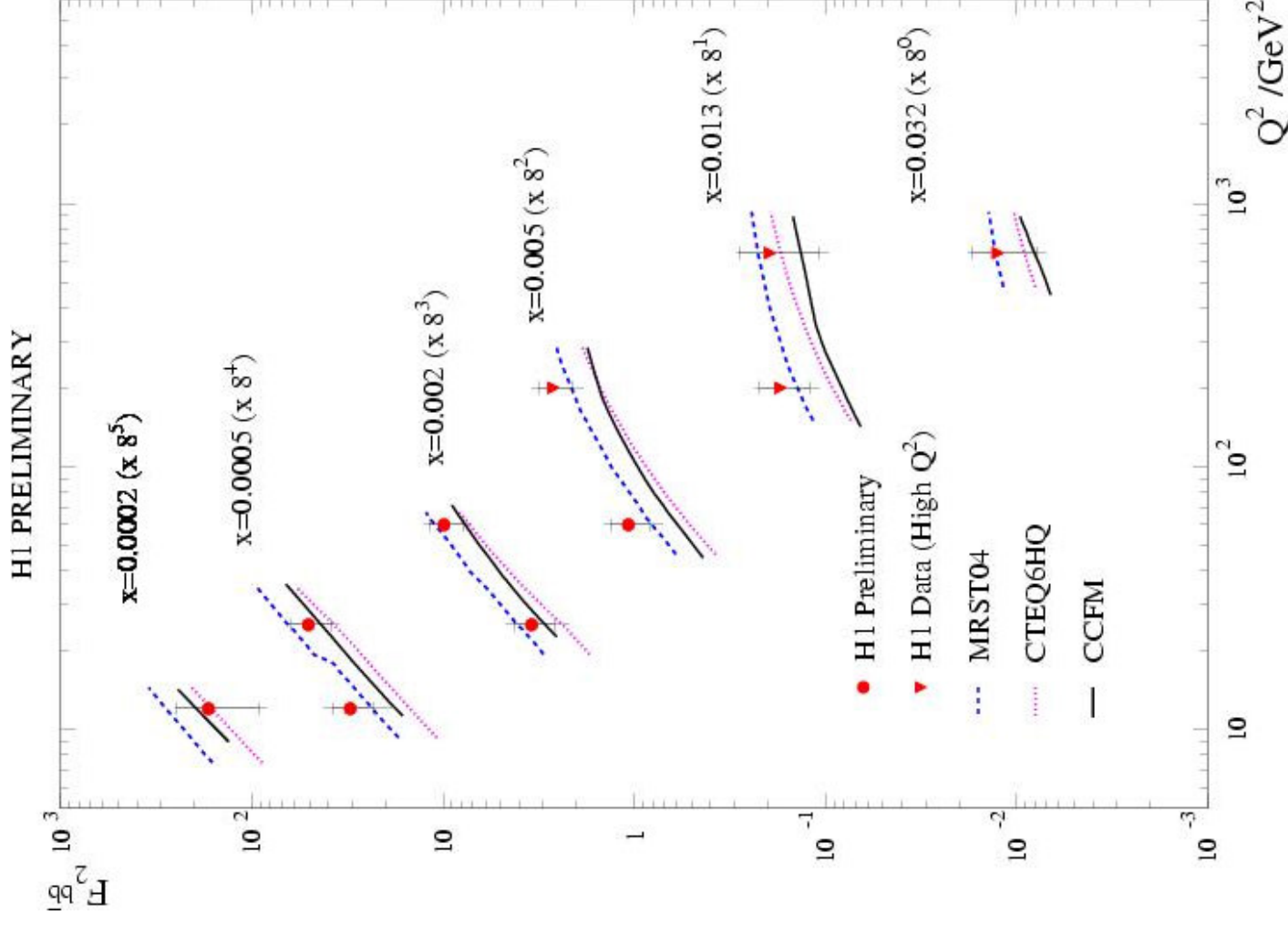
# $F_2^{cc}$ vs $Q^2$ in bins of $x$

Lumi  $\sim 57 \text{ pb}^{-1}$

Precise new measurements

In each  $Q^2, x$  bin:  
>70% kin. acceptance!

# $F_2^{b\bar{b}}$ vs $Q^2$ in bins of $x$

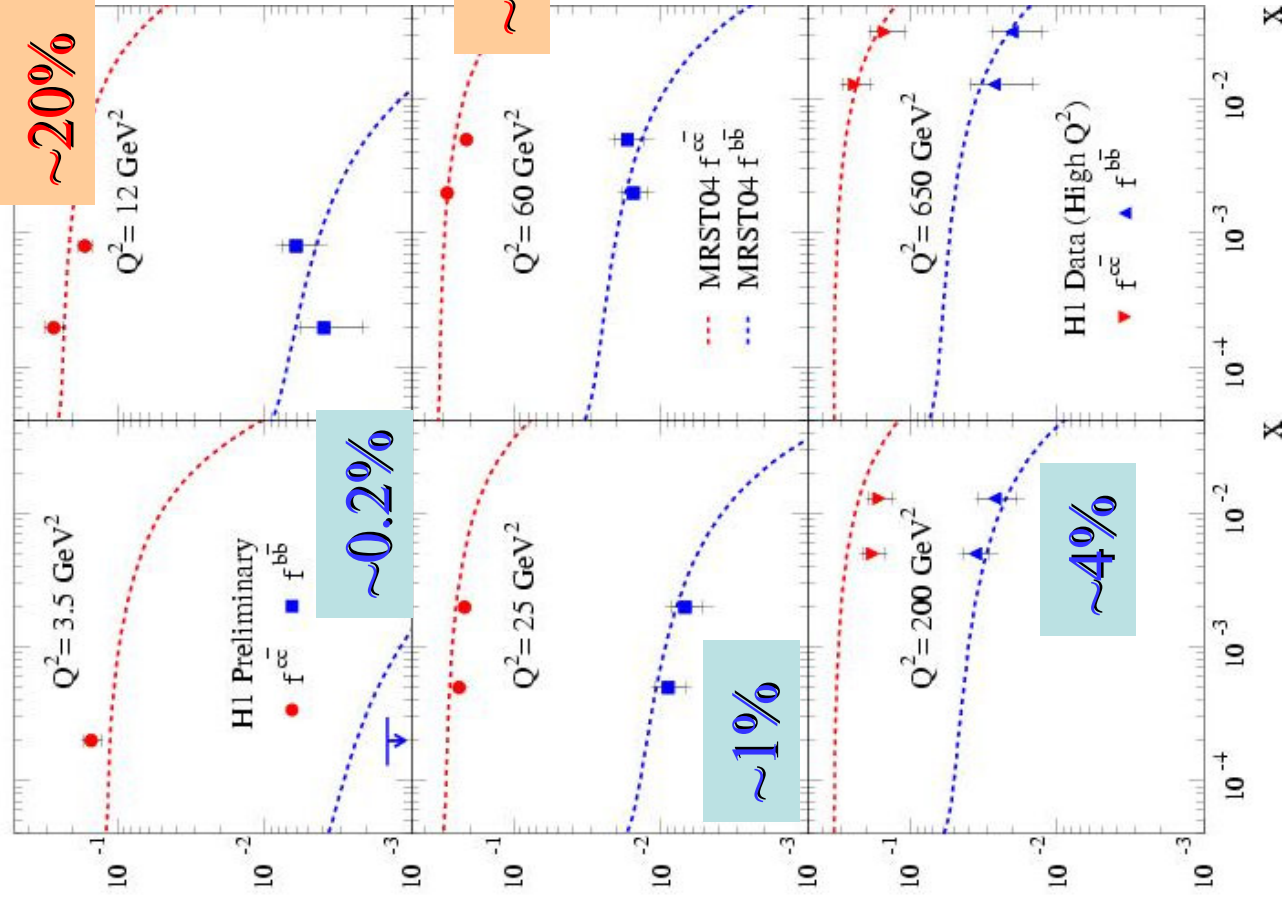


These are the first measurements of the proton beauty structure function!

Large scaling violations observed

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H1 PRELIMINARY



c and b contributions to the total x-secs

b contribution strongly rising with  $Q^2$

# QCD tests with final states

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## Jets:

- $\alpha_s$  determination

- Beauty production using events with muon and jets
- Photoproduction of  $D^*$  plus jet
- Charm and beauty high  $pt$  photoproduction
- D meson fragment. ratios and the charm fragmentation function
- Charm jets in DIS
- Jet shapes in tagged charm events
- c and b using  $D^*$  muon correlations

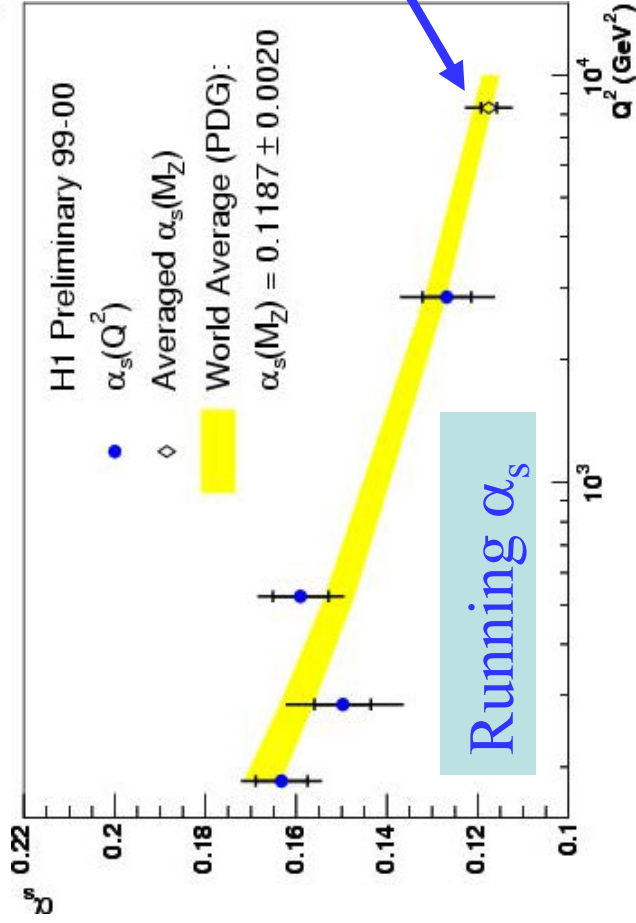
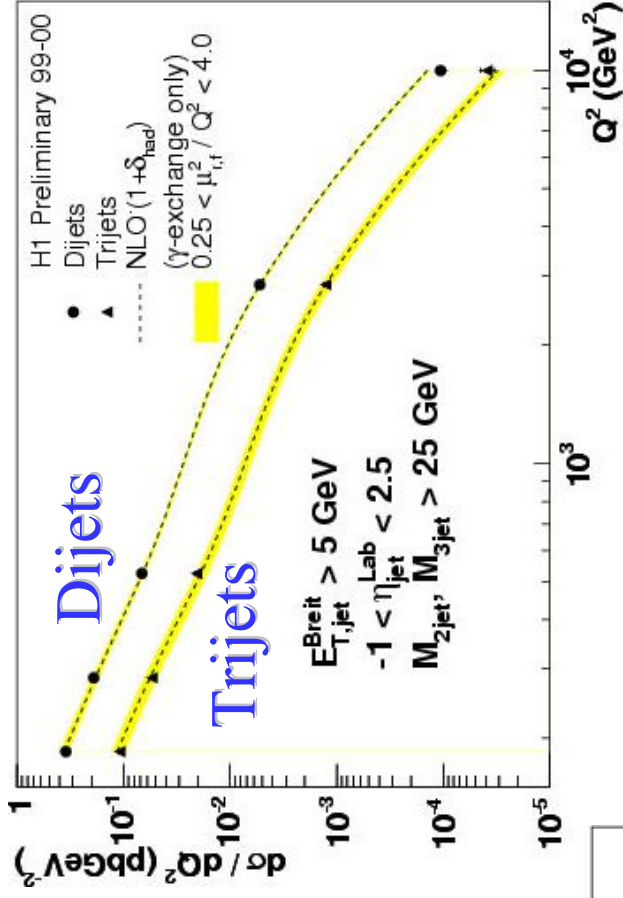
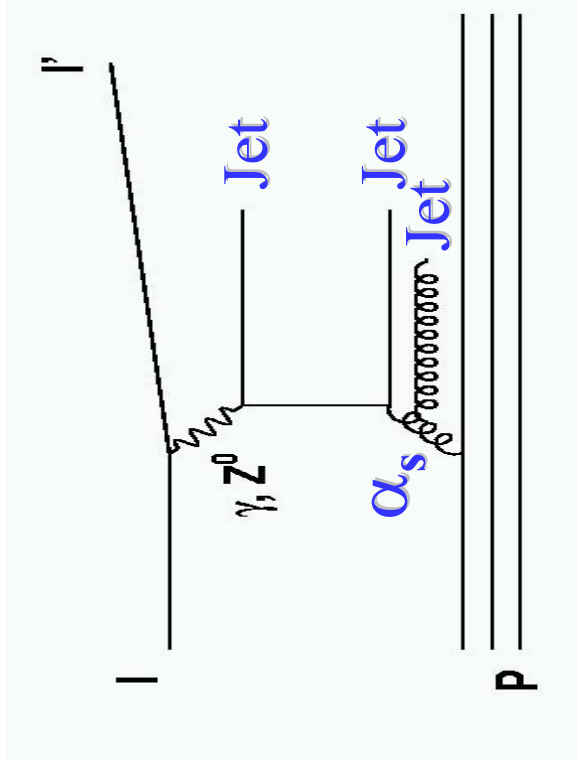
## Heavy flavours:

## Diffraction:

- Diffractive dijets
- Diffractive  $D^*$  and CC
- Elastic J/Psi production
- Diffract. photoprod. of rho at large t
- Dijet with a leading neutron
- Deeply virtual compton scattering



# $\alpha_s$ from 3jets/2jets at high $Q^2$

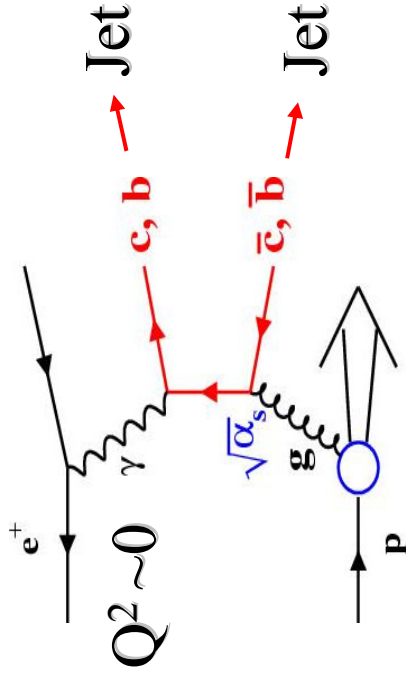


Average fitted  $\alpha_s(m_Z)$

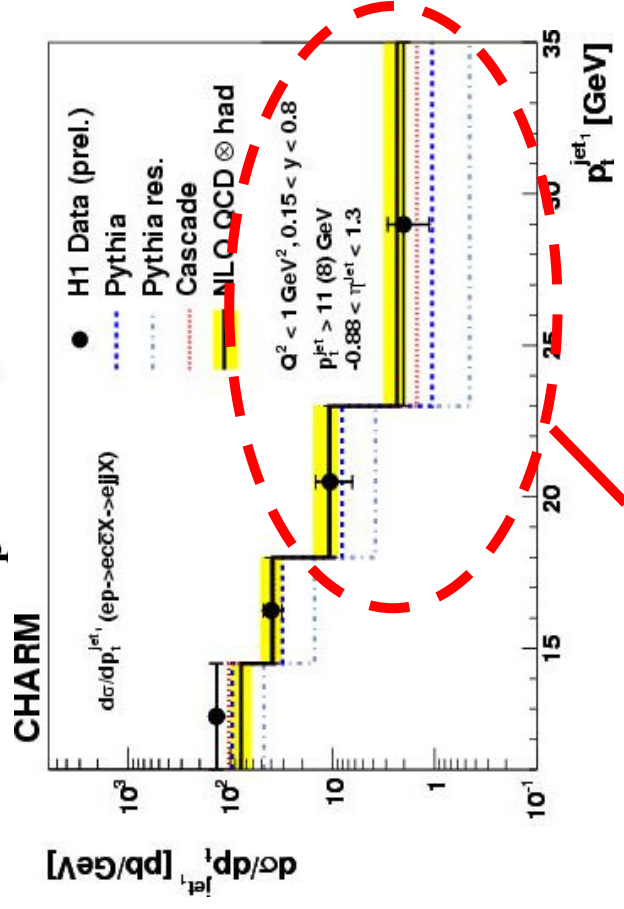
Running  $\alpha_s$

Consistent results

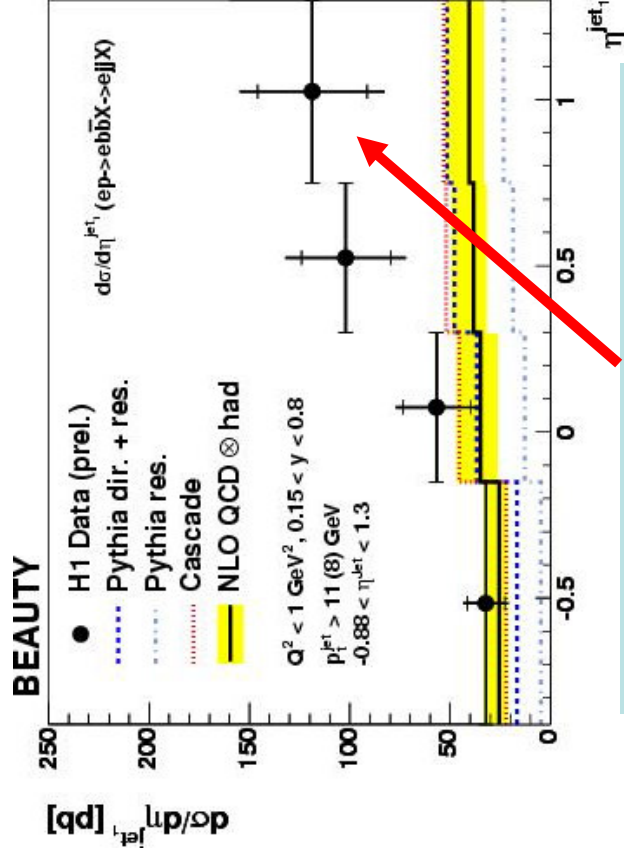
# Charm and Beauty in high pt dijet events ( $\gamma p$ )



Use impact par. of tracks in jets

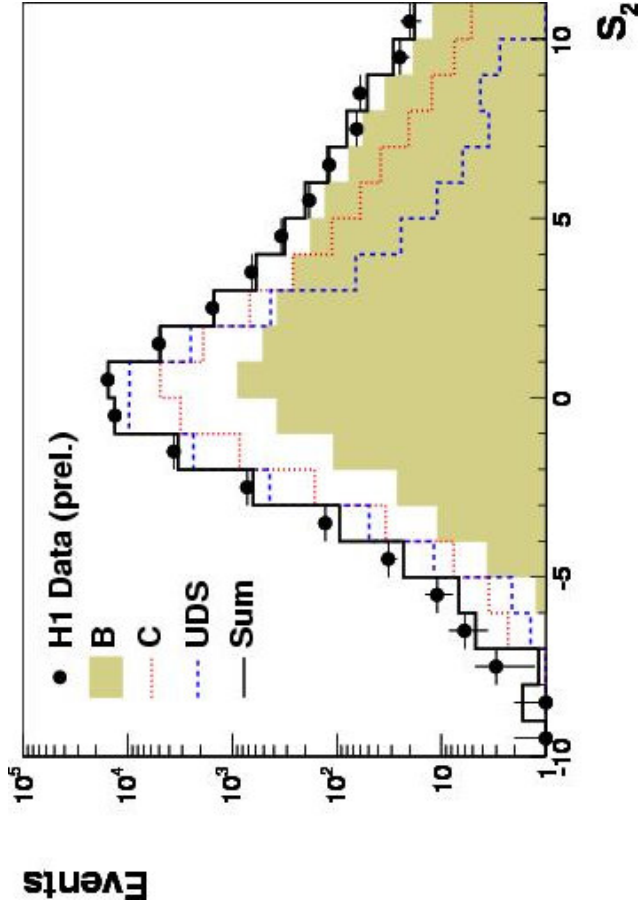


Higher  $p_T$  reached than for  $D^*$  measurements



Excess Data/NLO in more forward direction

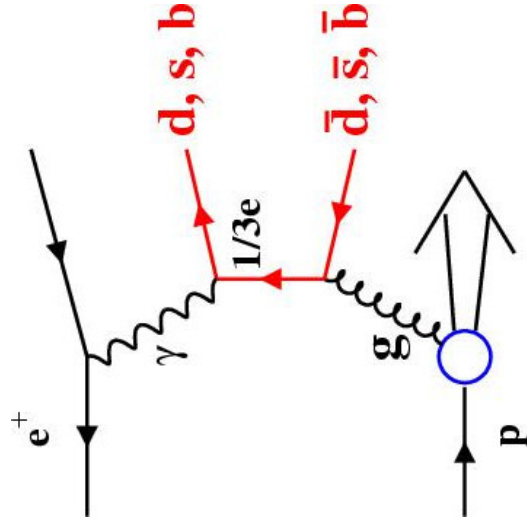
# Charm and Beauty in high pt dijet events ( $\gamma p$ )



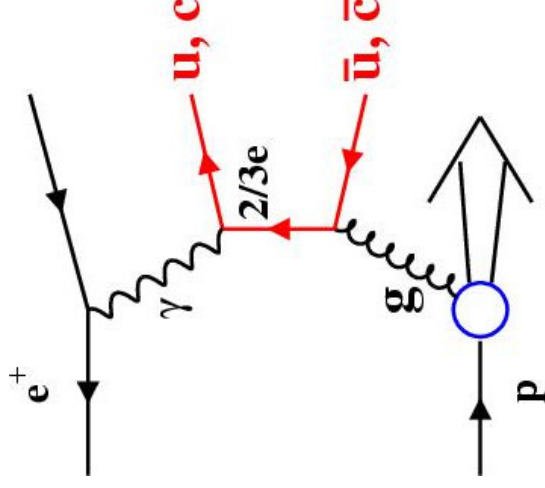
Visible range:  $pt_{jet1(2)} > 11(8)$  GeV

Measured quark fractions:  
 $f_{uds} \sim 58\%$ ,  $f_c \sim 35\%$ ,  $f_b \sim 7\%$

Reach almost values expected for massless u,d,s,c,b !

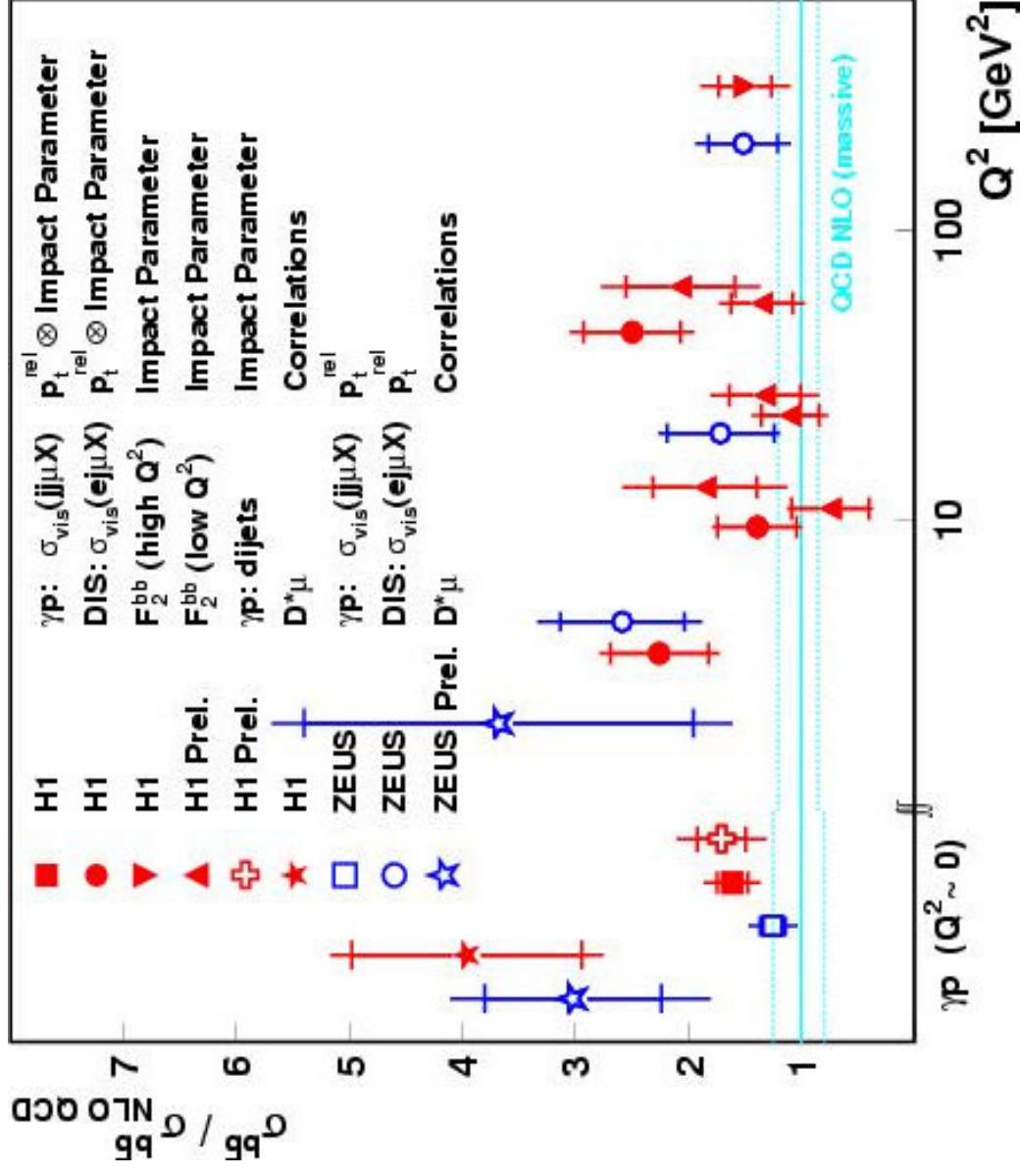


$\sim 1/11$



$\sim 4/11$

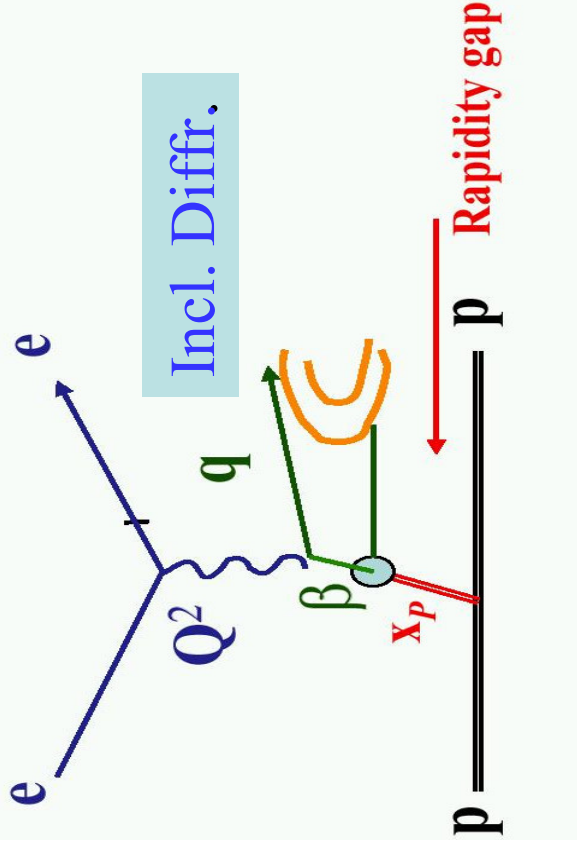
# Beauty HERA summary plot: Data/NLO vs $Q^2$



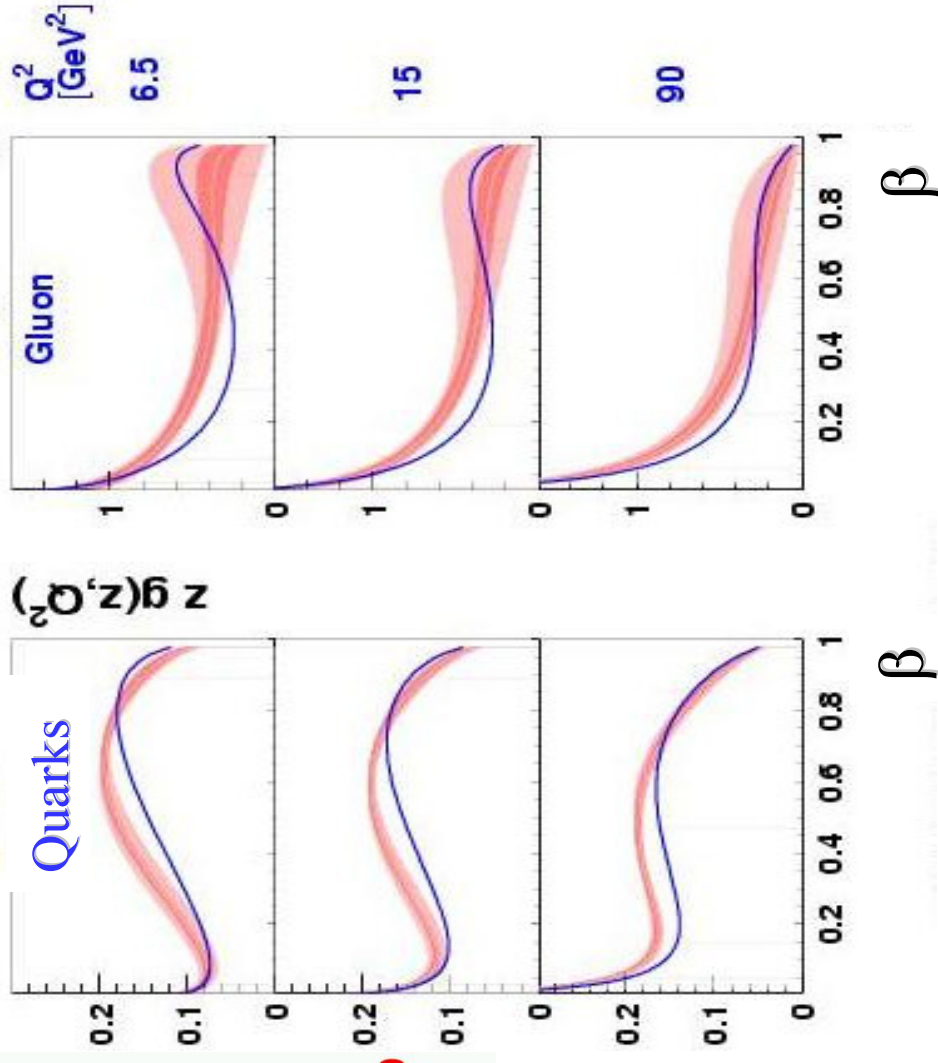
Many new data points since last year

Main question (with long history): Excess data/NLO ?

# Diffraction: Diffractive parton densities



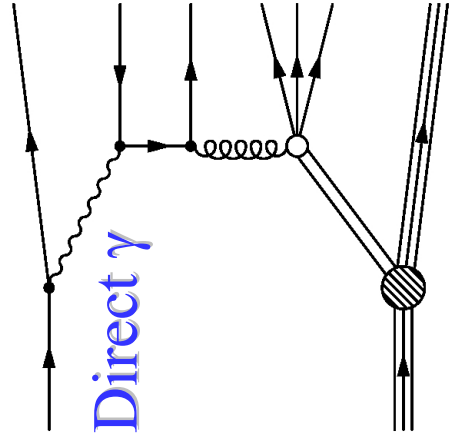
H1 NLO analysis (2002)



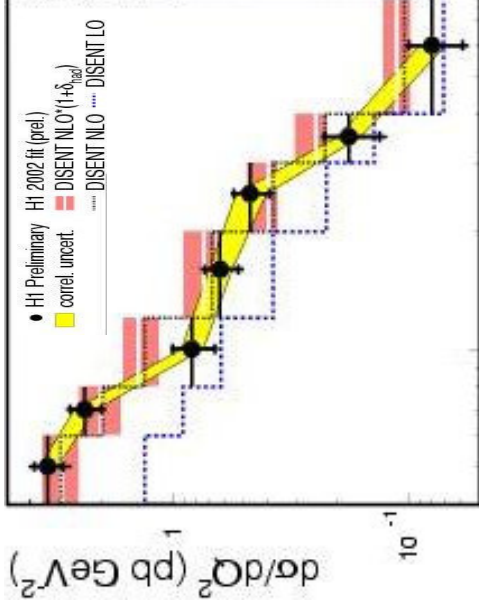
Can we use these gluon and quark densities to predict other processes?  
**QCD factorisation?**  
 Tevatron  $pp \rightarrow$  fact. fails

# Diffractive dijets at HERA

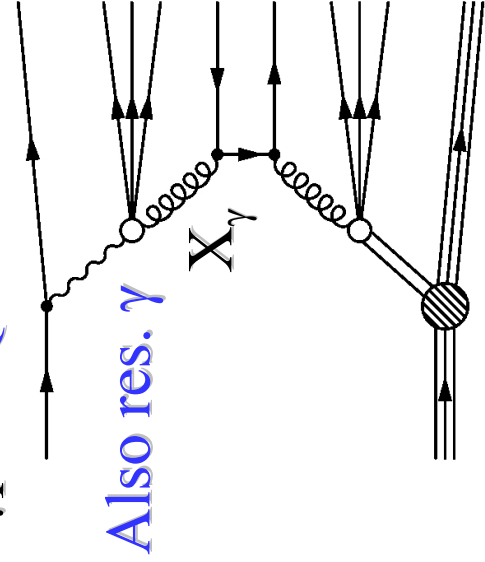
DIS:  $Q^2 > 1 \text{ GeV}^2$



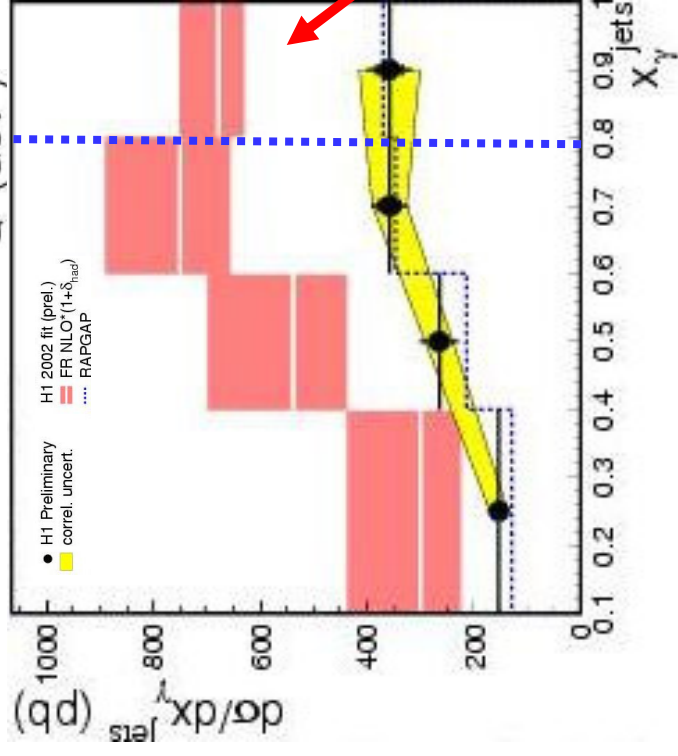
Factorisation ok



$\gamma p$ :  $Q^2 \sim 0$



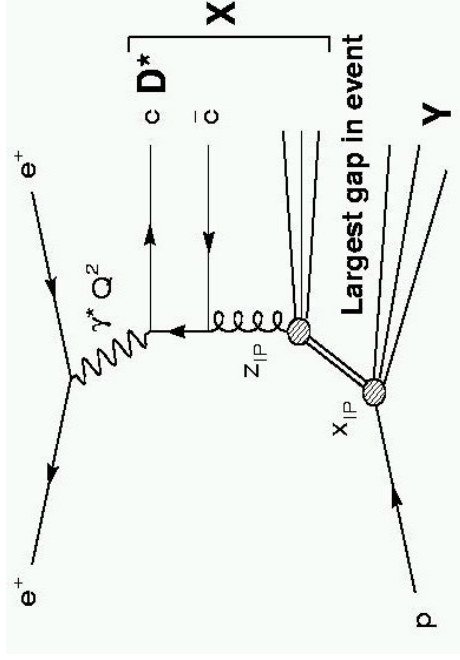
Factorisation broken!



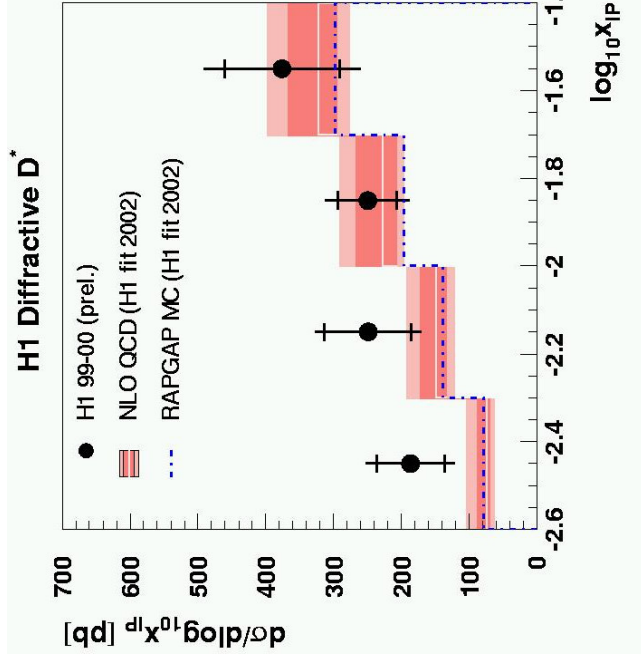
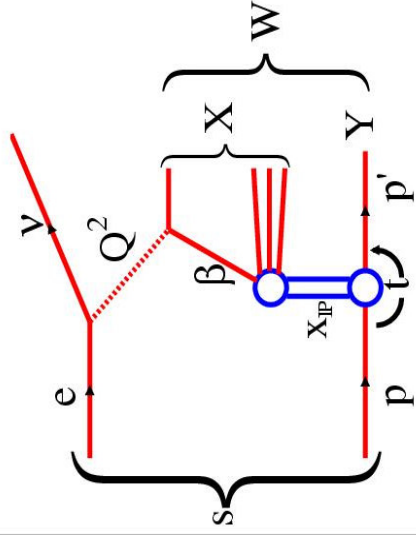
Why suppression also for more direct  $\gamma$  events ??

# Diffractive factorisation tests: CC, charm

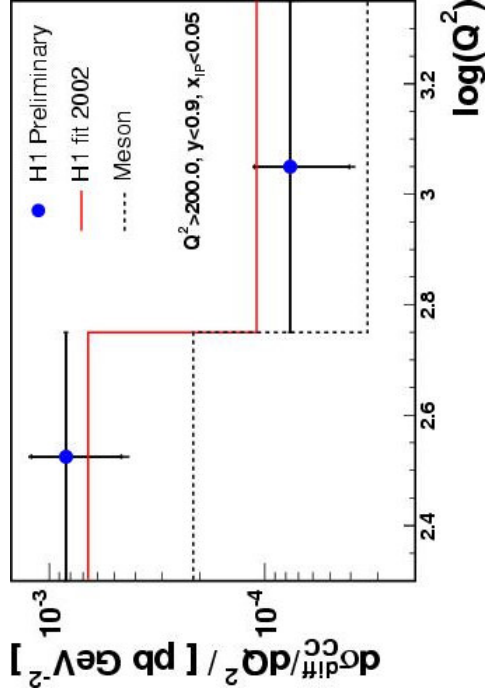
Charm:



Charged Current:

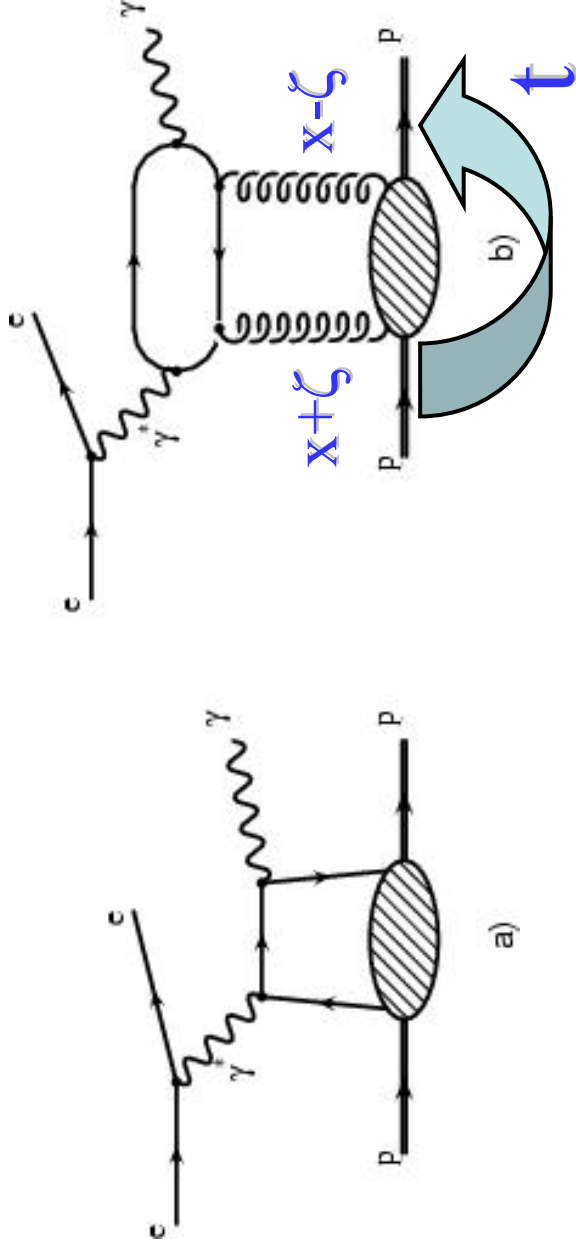


Factori-  
sation ok



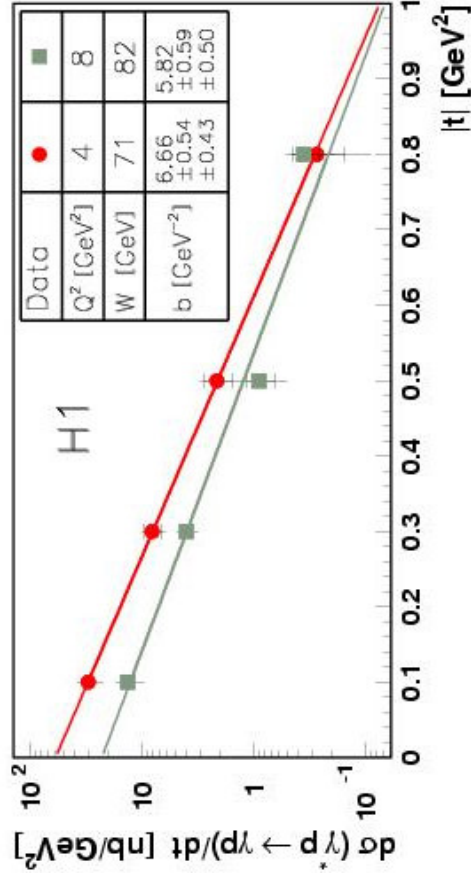
Data just  
become  
significant

# Deeply virtual compton scattering

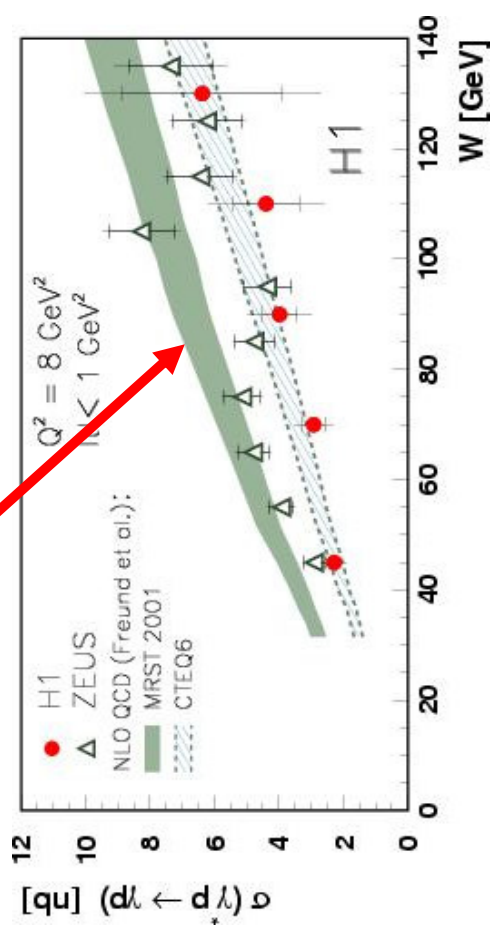


Access to skewed parton densities

First  $t$  slope measurement

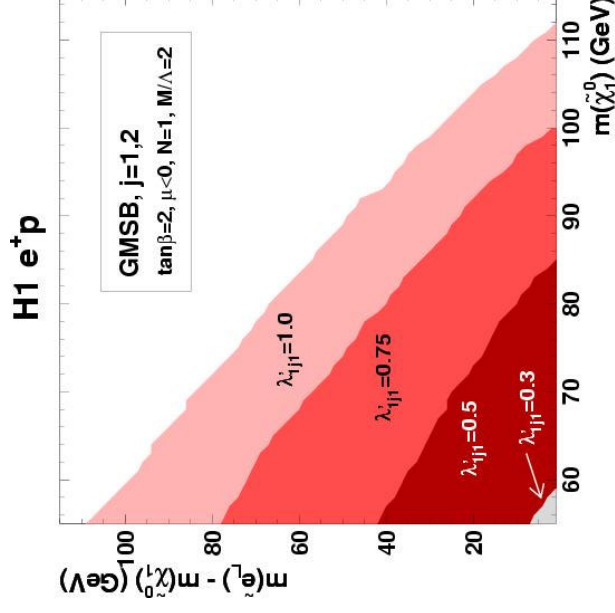
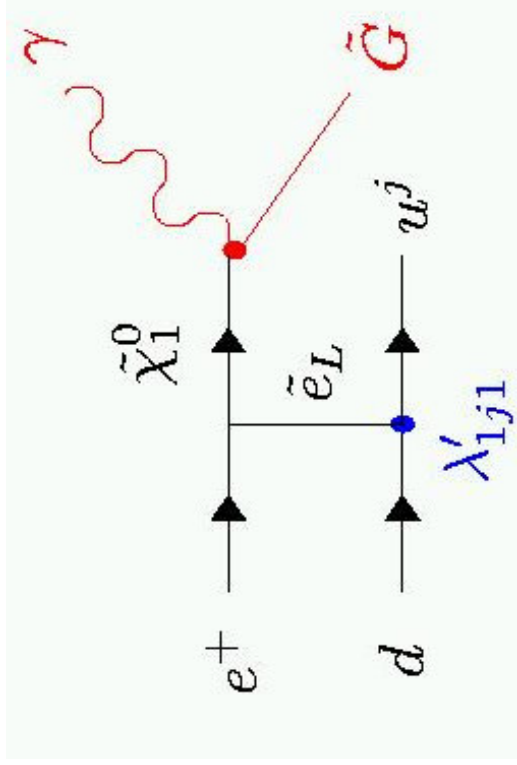
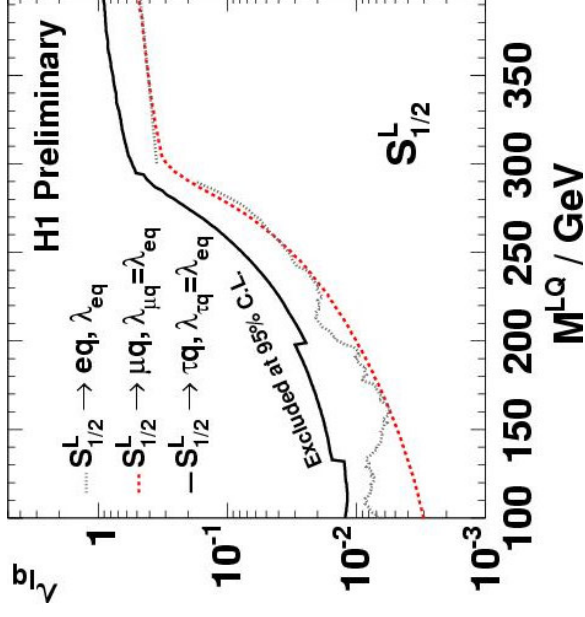
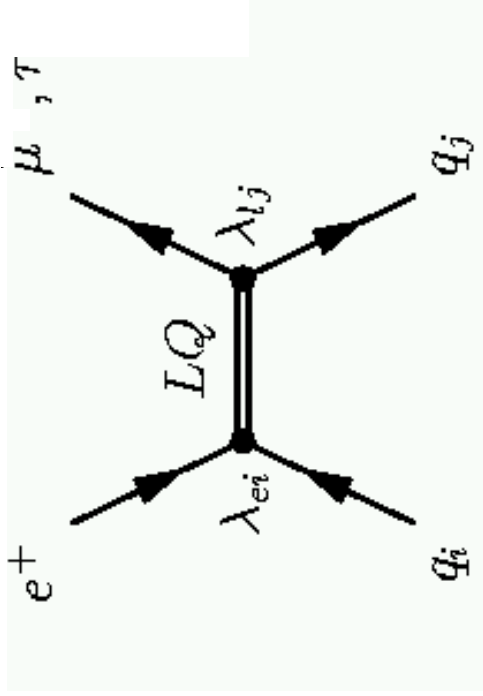


Fix norm. of pQCD models



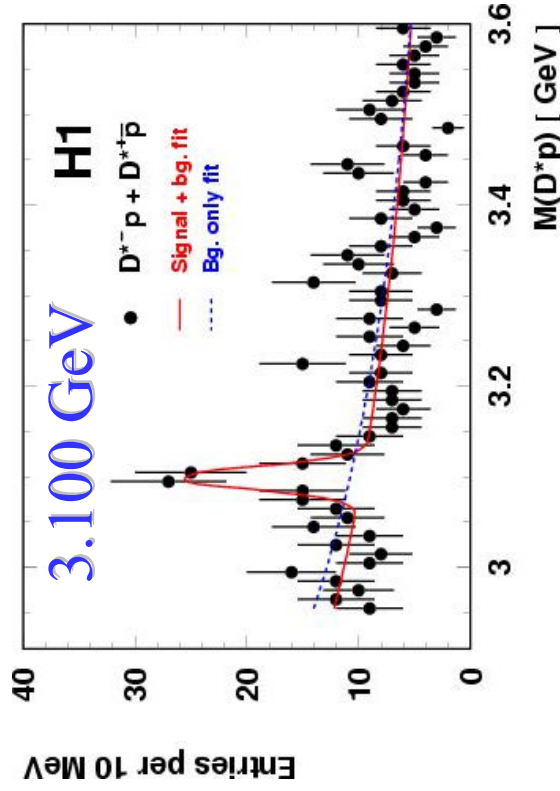


# Searches: Lepton flav. violation, light Gravitinos



# D\*<sup>\*</sup>p(3100) resonance

hep-ex03012



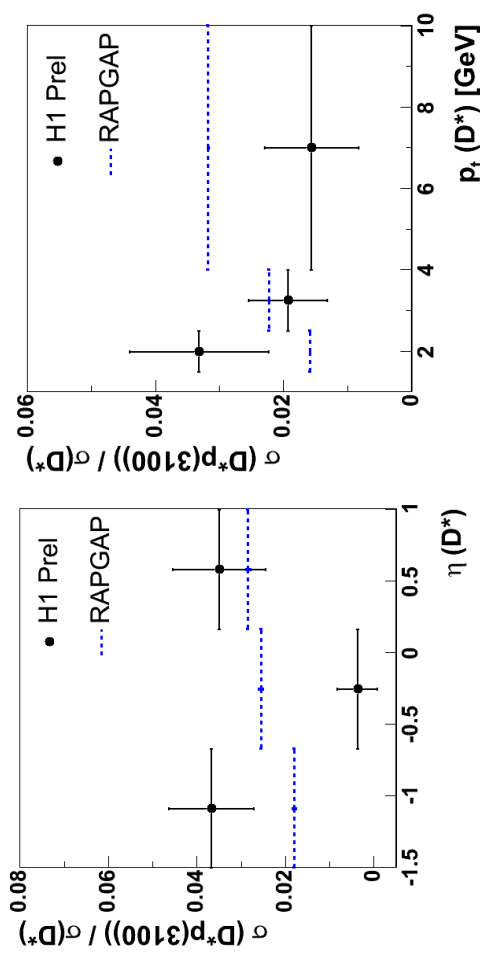
Not confirmed (so far)  
by other experiments

New for DIS05:

Acceptance corr. event yields

$$\frac{\sigma(D^*p(3100) \rightarrow D^*p)}{\sigma(D^*)} = (1.59 \pm 0.33^{+0.33}_{-0.45})\%$$

Differential studies:

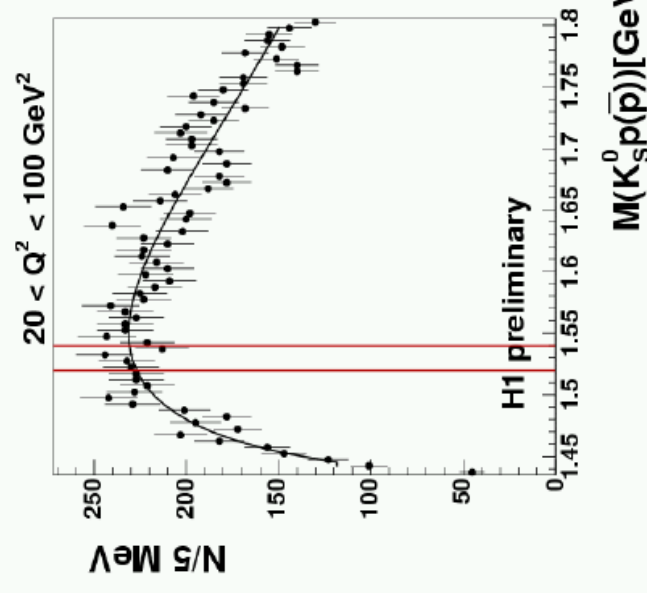
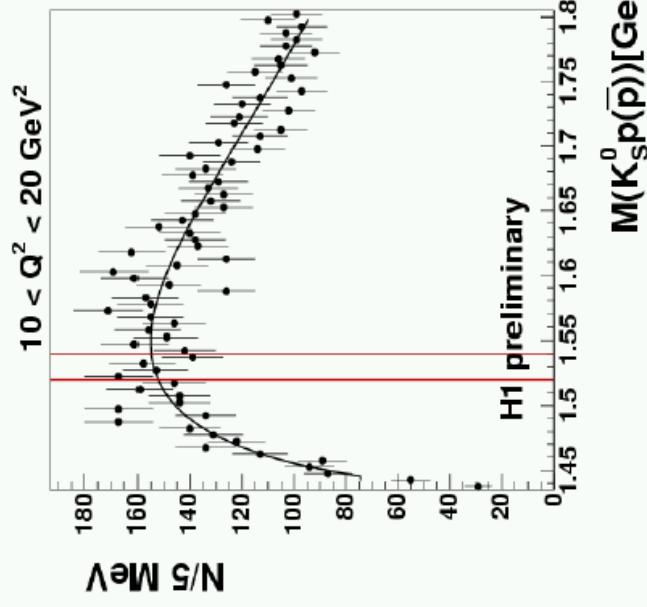
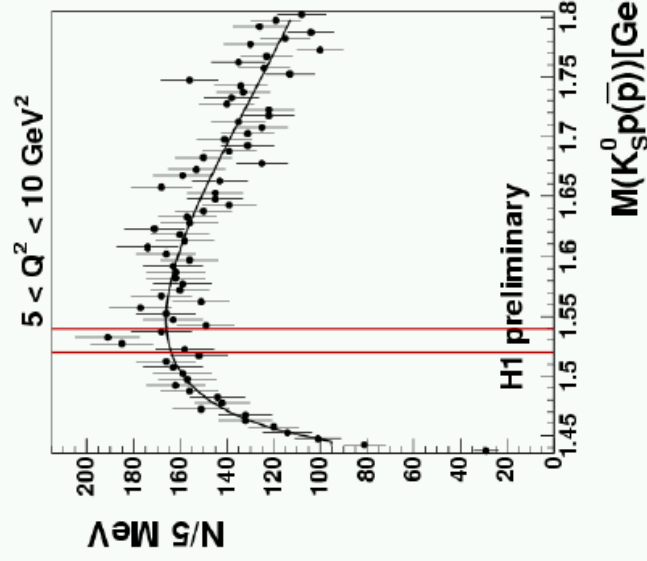


Compare to simple model (e.g. with isotropic decay)

# Strange Pentaquark (?)

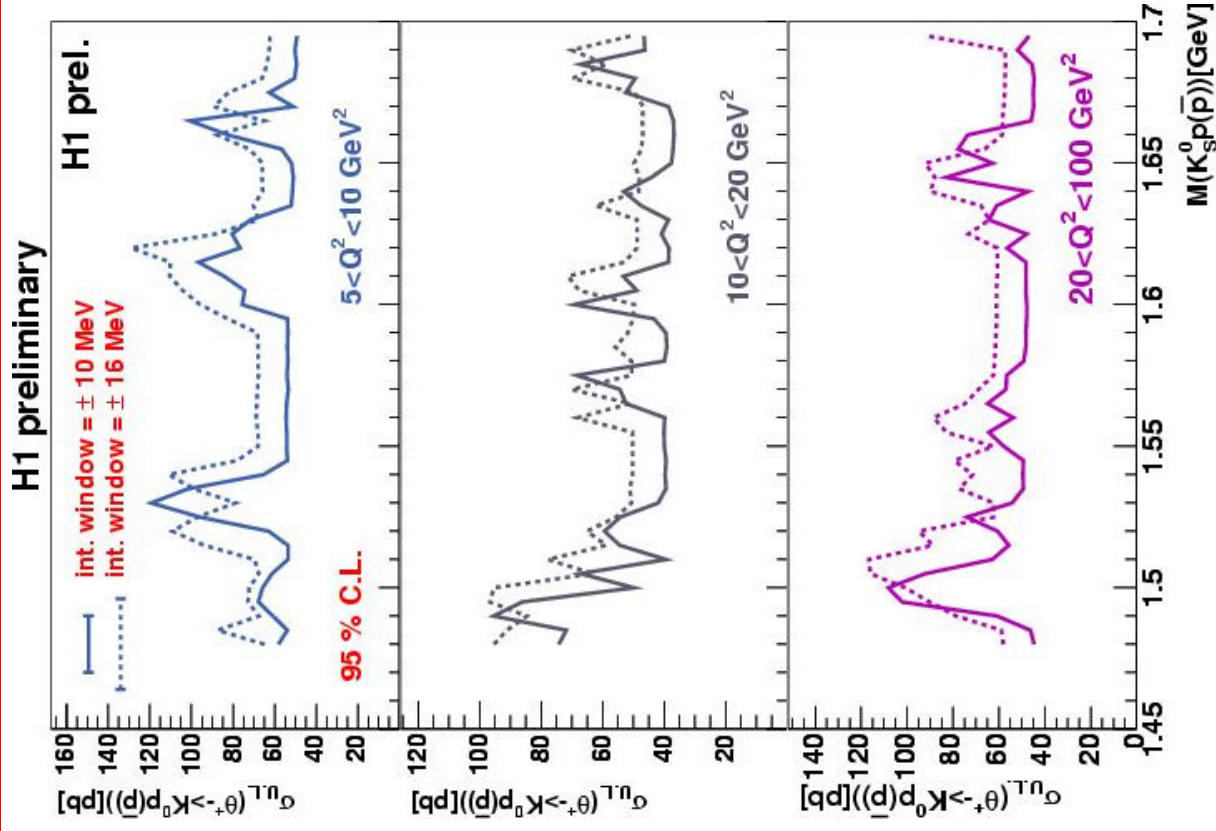
Search for  $\theta^+(1530) \rightarrow K^0_s p$

Lumi=75 pb<sup>-1</sup>



No significant signal

# Strange Pentaquark (?)



Search for  $\theta^+(1530) \rightarrow K_S^0 p$

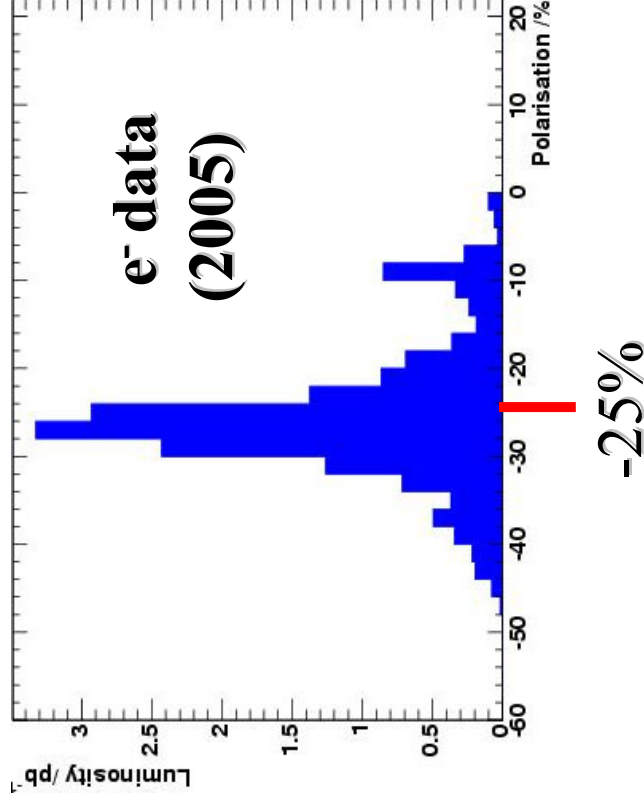
95% c.l. cross-section limits

# HERA II data

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HERA II runs with polarised  
electron (positron) beams

H1 physics analysis:  
~ 53 pb<sup>-1</sup> e<sup>+</sup>p (2003-2004)  
~ 21 pb<sup>-1</sup> e<sup>-</sup>p (2005)

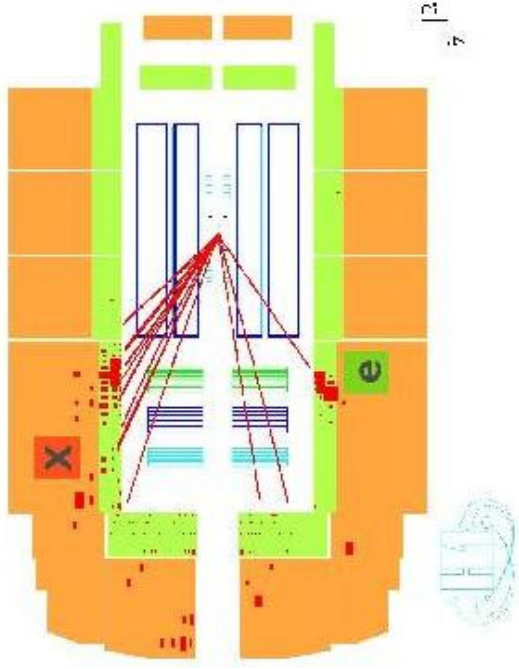
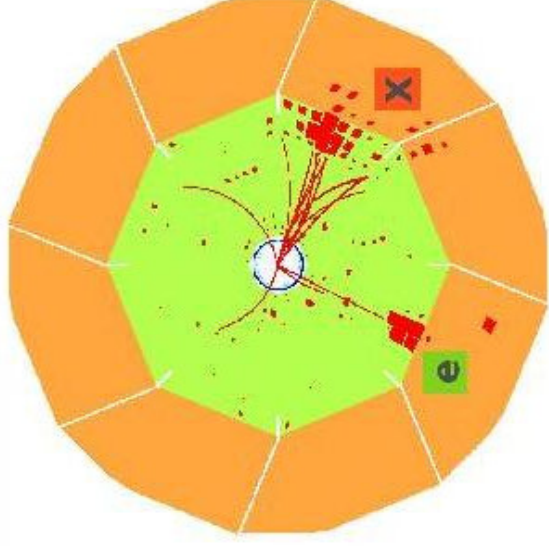


# Isolated lepton events with large $p_t^{\text{miss}}$

Excess Data/SM in HERA I data both for e and  $\mu$

Six new e events in HERA II data!

e event  
from 2004



$P_T^e = 37 \text{ GeV}$ ,  $P_T^{\text{miss}} = 44 \text{ GeV}$ ,  $P_T^X = 29 \text{ GeV}$

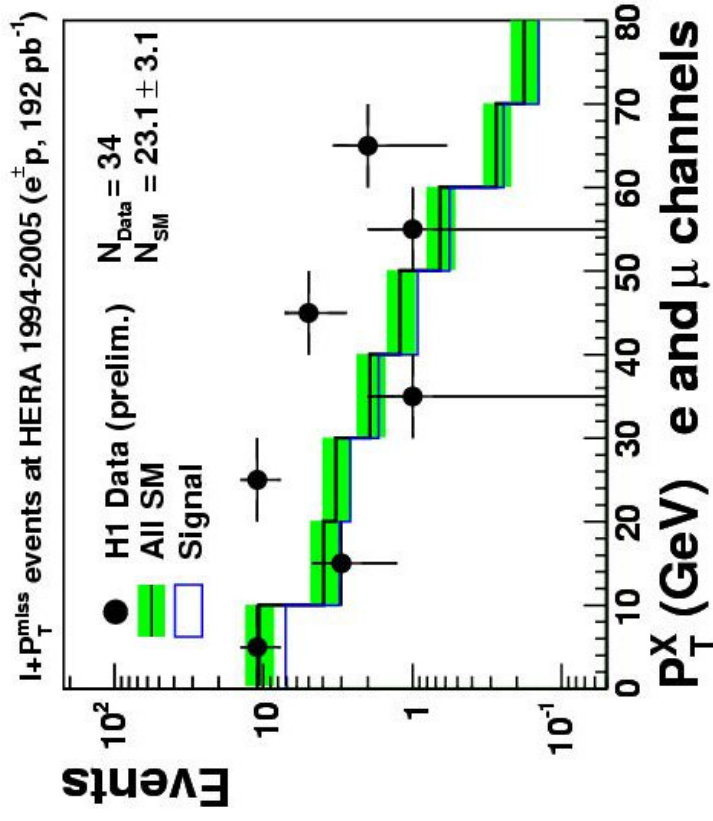
But: No  $\mu$  events  
(yet) in HERA II

Need much more  
lumi to clarify!



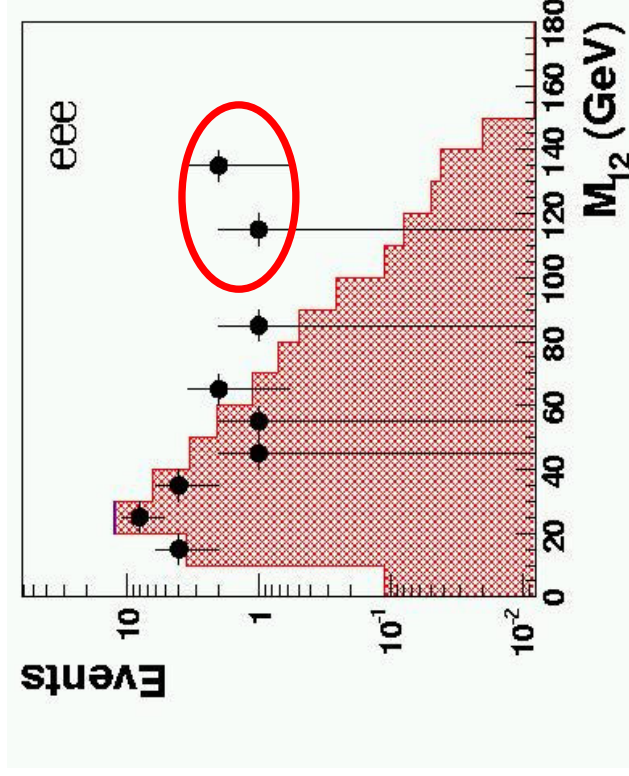
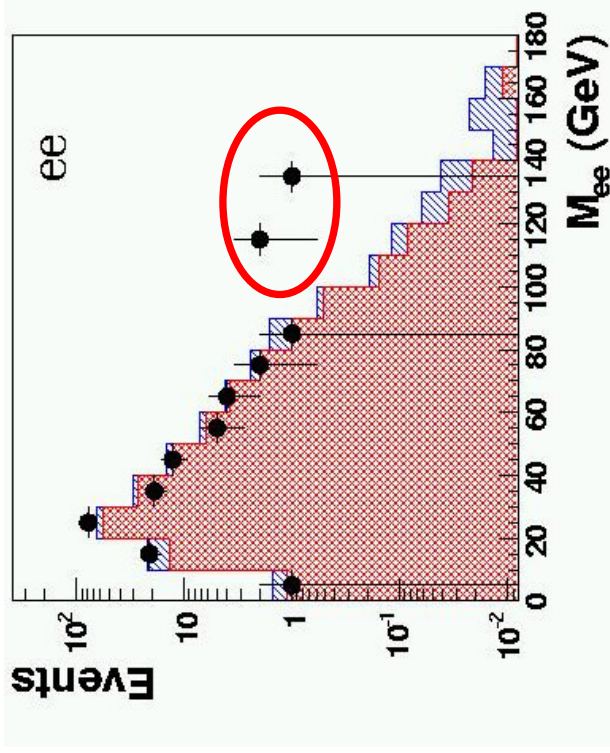
# Isolated lepton events with large $p_t^{\text{miss}}$

<b><math>e^+p</math> (1994-2005) 192 <math>\text{pb}^{-1}</math></b>			
	Electron	Muon	
	obs./exp. (W)		
All $P_T^X$	25/18.3 $\pm$ 2.5 (70%)	9/4.8 $\pm$ 0.8 (85%)	
$P_T^X > 25$ GeV	11/3.0 $\pm$ 0.6 (81%)	6/3.0 $\pm$ 0.6 (86%)	



# Multilepton events

1996-2004  $e^+p$   $L=163 \text{ pb}^{-1}$  (ICHEP04)



New for DIS 2005: Analysis of 2005  $e^-$  data ( $21 \text{ pb}^{-1}$ ):

H1 Preliminary		Multi-lepton analysis $e^-p$ 2005 ( $21 \text{ pb}^{-1}$ )	
Selection	Data	SM	Pair Production (GRAPE) NC-DIS + Compton
$ee$	21	$21.1 \pm 1.9$	$17.2 \pm 1.9$
$e\mu$	8	$10.8 \pm 2.5$	$6.6 \pm 0.6$
$eee$	1	$4.2 \pm 0.7$	$4.2 \pm 0.7$
$e\mu\mu$	6	$5.4 \pm 0.9$	$5.4 \pm 0.9$

No new high mass events

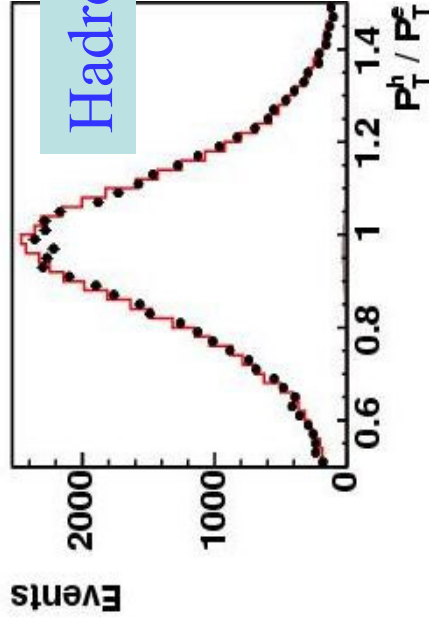
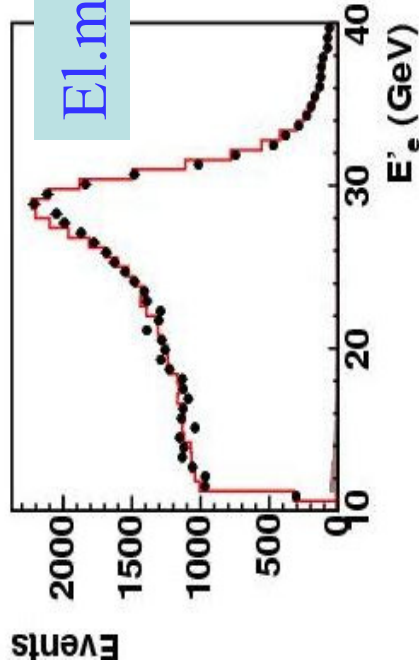


# CC cross section as a function of polarisation

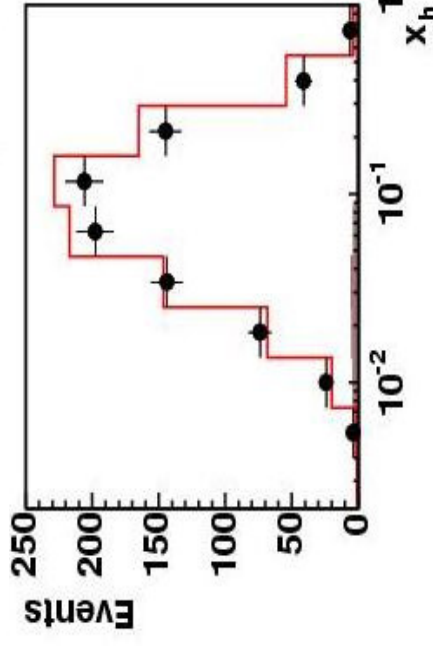
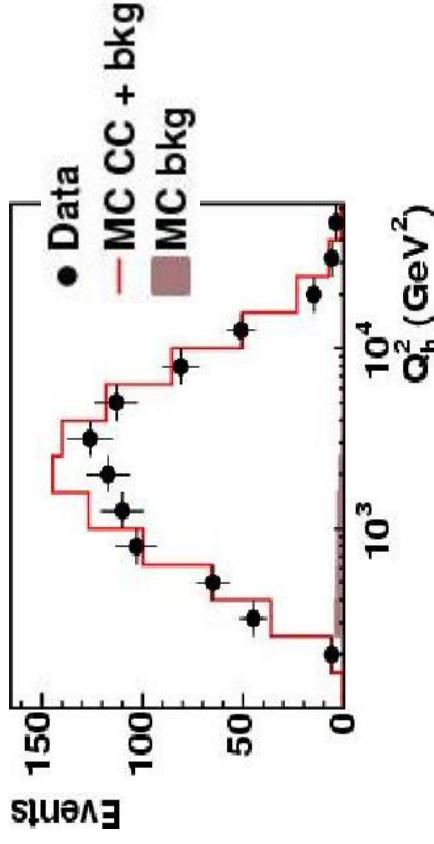
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Requires excellent control of calorimeter energy scales

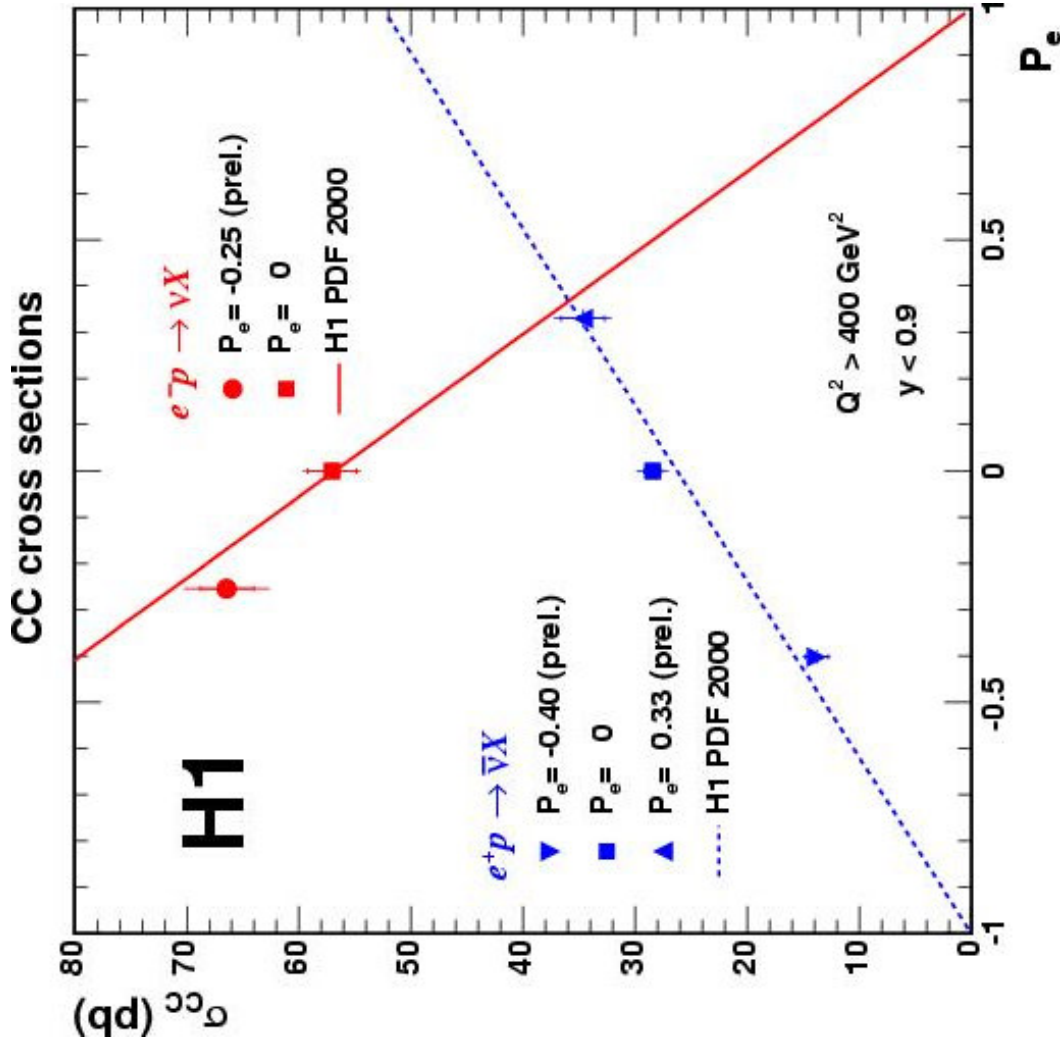
Neutral current analysis  
→ used for calibration



Charged current analysis



# CC cross section as a function of polarisation



With brandnew data!

Much effort invested  
e.g. for control of Lumi

Polarisation dependence  
as expected from SM

# Summary

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- **H1 physics highlights for DIS2005:**
  - ◆ **Electroweak parameters**
  - ◆  **$F_2^{cc}$  and  $F_2^{bb}$**
  - ◆  **$\alpha_s$  from 3/2 jets**
  - ◆ **Charged current with polarised electrons**
- **Physics fun is continuing: Waiting for much higher luminosities!**

# Summary of H1 results presented at DIS05

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- Polarisation dependence of the total charged current cross section (Andrei Nikiforov)
- Multi-lepton events and searches for the doubly charged Higgs (Andre Schoening)
- F2 and determination of the longitudinal proton structure function F1 at low Q2 (Alexey Petrukhin)
- F2 at low Q2 in QED compton scattering at HERA (Ewelina Lobodzinska)
- W boson mass and the light quark couplings to the Z boson (Benjamin Porthault)
- F2cc and F2bb at low and high Q2 using the H1 vertex detector (Tatsiana Klimkovich)
- Jet production at high Q2 (Thomas Kluge)
- Forward jets at low x in DIS (Albert Knutsson)
- Beauty production using events with muon and jets (Olaf Behnke)
- Photoproduction of D\* plus jet (Gero Flucke)
- Charm and beauty high pt photoproduction (Lars Finke)
- D meson fragmentation ratios and the charm fragmentation function (Zuzana Rurikova)
- Charm jets in DIS (Adrian Perieanu)
- Jet shapes in Charm photoproduction (Maria Martisikova)
- Charm and beauty using D\* muon correlations (Nick Malden)
- F2D and diffractive CC (Paul Laycock)
- Diffractive dijets (Matthias Mozer)
- Diffractive D\* (Matthew Beckingham)
- Elastic J/Psi production (Christian Kiesling)
- Diffractive photoproduction of rho at large t (Carl Gwilliam)
- Dijet cross sections for events with a leading neutron (Armen Bunatian)
- Deeply virtual compton scattering (Sasha Glazov)
- Prompt photons in photoproduction (Josef Ferencei)
- SUSY searches (Dave South)
- Searches for leptons and lepton flavour violation (Linus Lindfeld)
- Isolated lepton searches (Christian Veelken)
- Analysis of the anti-charmed baryon state at H1 (Karin Daum)
- Search for a narrow baryonic resonance decaying to K0s p(pbar) (Christiane Risler)