H1 Status Report

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- Objectives
- Recent Physics Results
- Data & MC Processing

66th DESY PRC Meeting, Oct. 1st, 2008, DESY Zeuthen

Objectives

- data statistics:
  - HERAI & HERAII high energy: ~500 pb^{-1}
  - HERAII medium & low energy: ~ 20 pb^{-1}
- precision (systematics):
  - improved reconstruction (alignment, calibration) & simulation

➔ final answers on:

- searches for new phenomena
- understanding of QCD: hadronic final state, heavy flavours, fragmentation, diffraction
- precision QCD: proton structure functions, parton density functions, α_S

New H1 Results since last PRC Meeting

6 Publications:

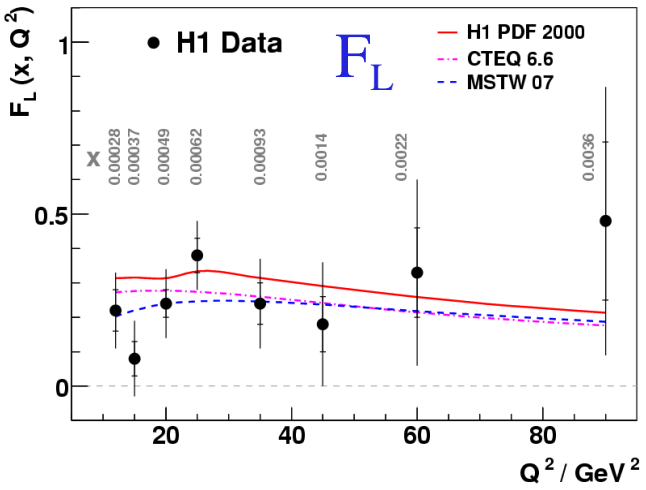
- Search for Excited Electrons in *ep* Collisions at HERA
- Measurement of the Proton Structure Function $F_L(x,Q^2)$ at Low x
- Multi-Lepton Production at High Transverse Momenta in *ep* Collisions at HERA
- Measurement of Diffractive Scattering of Photons with Large Momentum Transfer at HERA
- Study of Charm Fragmentation into $D^{*\pm}$ Mesons in Deep-Inelastic Scattering at HERA
- Strangeness Production at low Q^2 in Deep-Inelastic *ep* Scattering at HERA

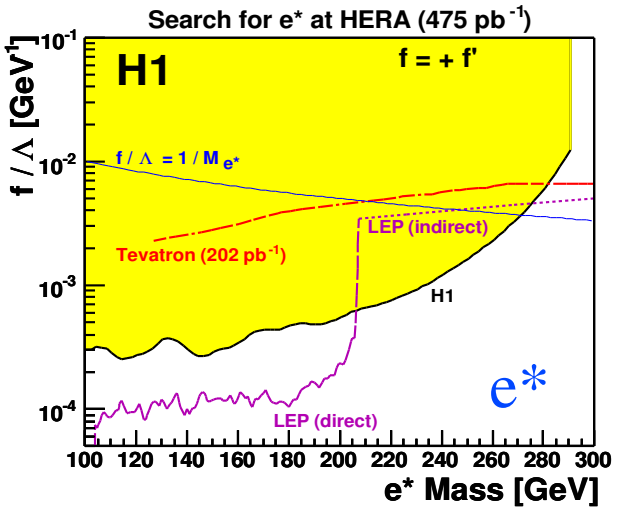
8 Preliminaries for ICHEP:

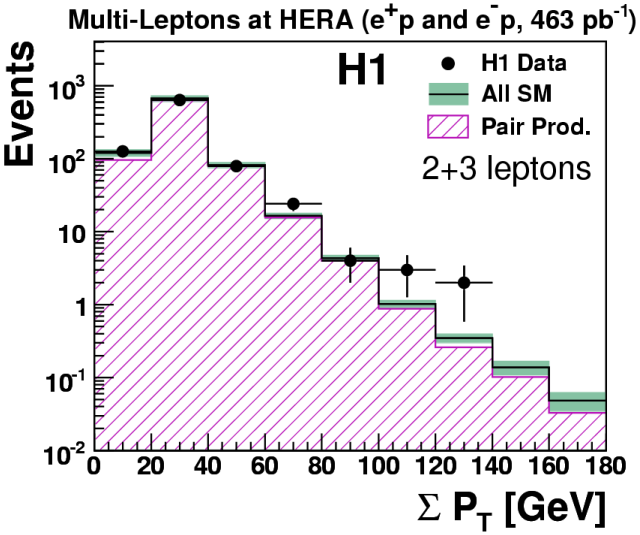
- A search for excited quarks in *ep* collisions at HERA
- Leading Neutron production in DIS at HERA
- Study of Multiple Interactions in photoproduction at HERA
- $K^{*\pm}$ production at low Q^2
- A Measurement of Beauty Photoproduction Through decays to Muons and Jets at HERAII
- $D^{*\pm}$-Meson Production at Large Q^2 Deep Inelastic Electron-Proton Scattering at HERA
- Extraction of the Charm Contribution to the Proton Structure Function F_2^c from $D^{*\pm}$ Measurements in Deep Inelastic Scattering at HERA
- Measurement of F_2^c and F_2^b using the H1 Vertex Detector at HERA

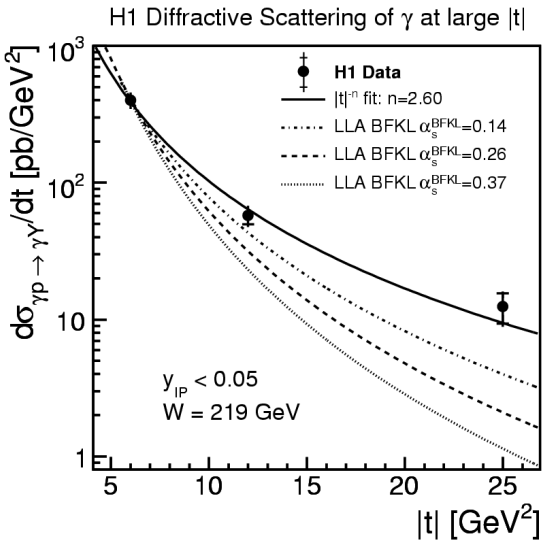
H1@ICHEP:
63 papers
2 plenary talks } H1 +
18 parallel talks } ZEUS

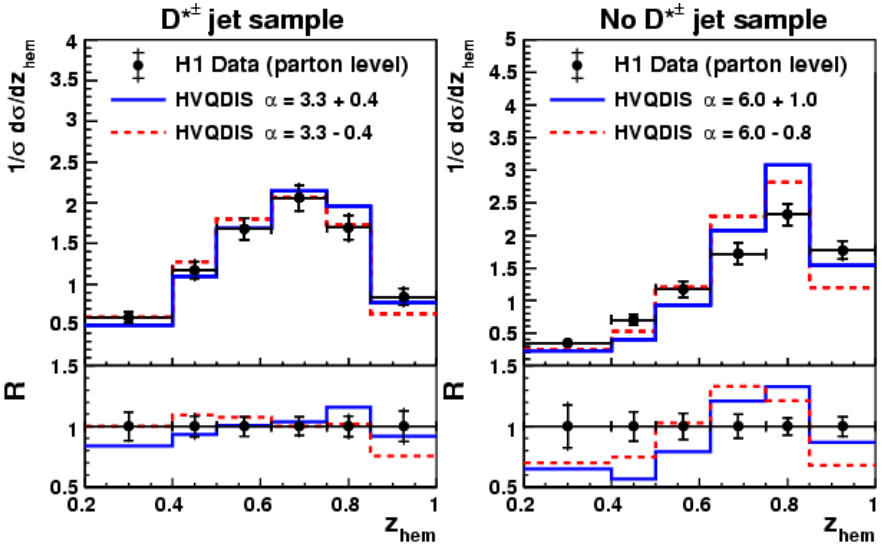
Publications



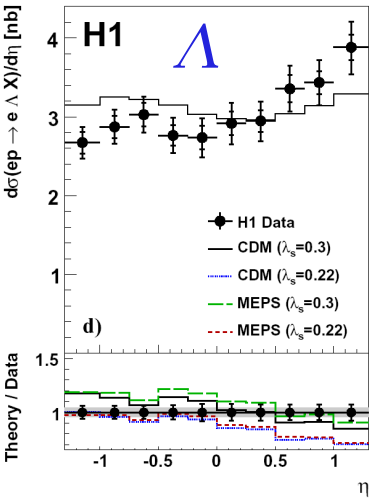




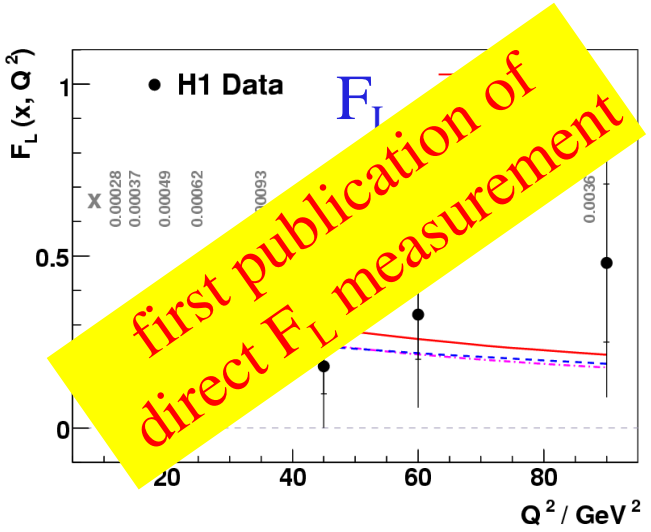


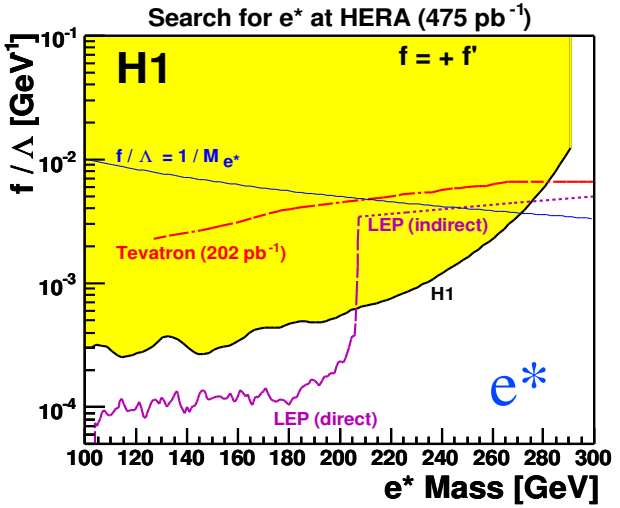


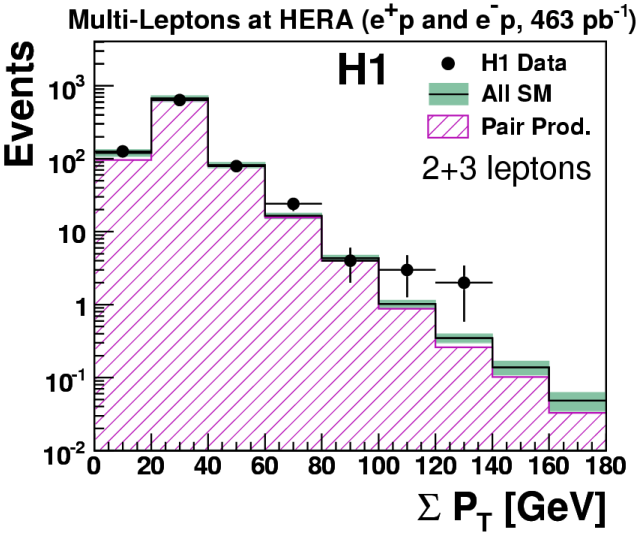
strangeness

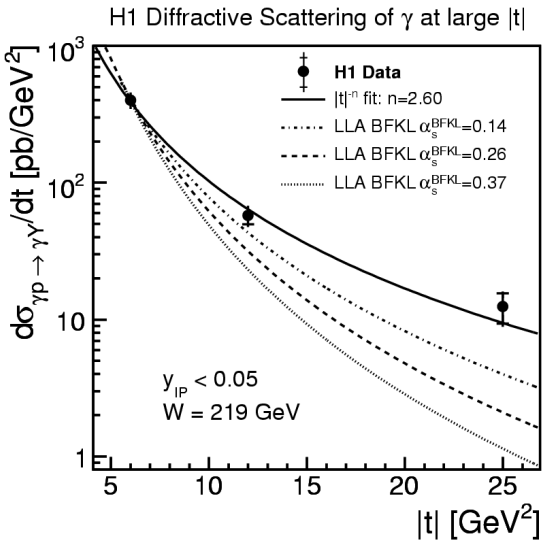


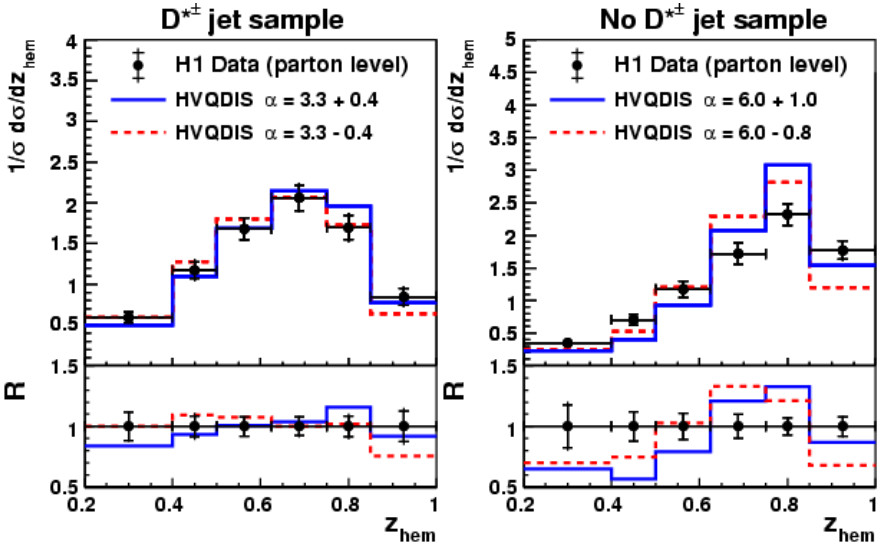
Publications



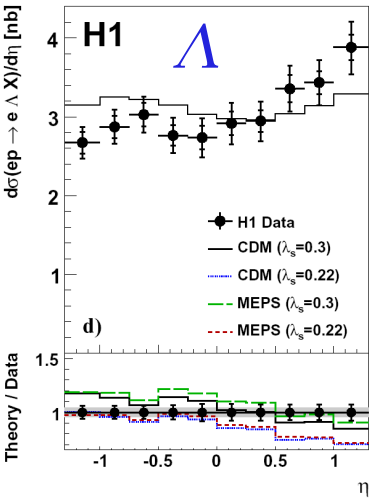




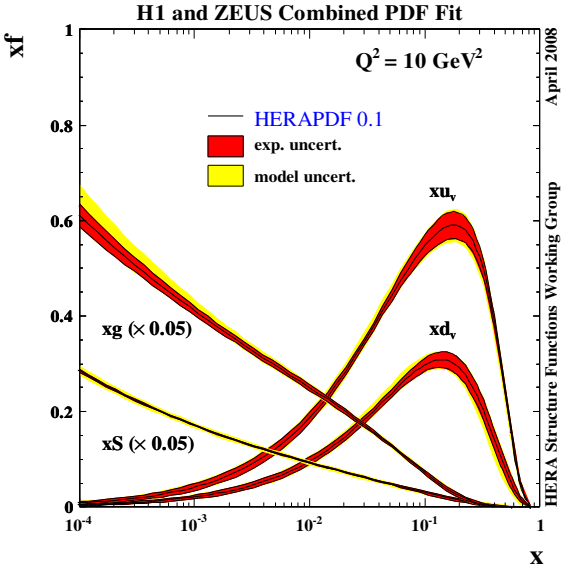




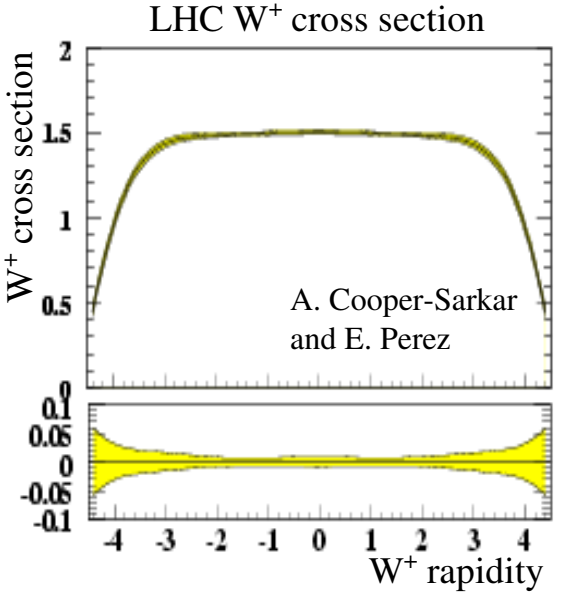
strangeness

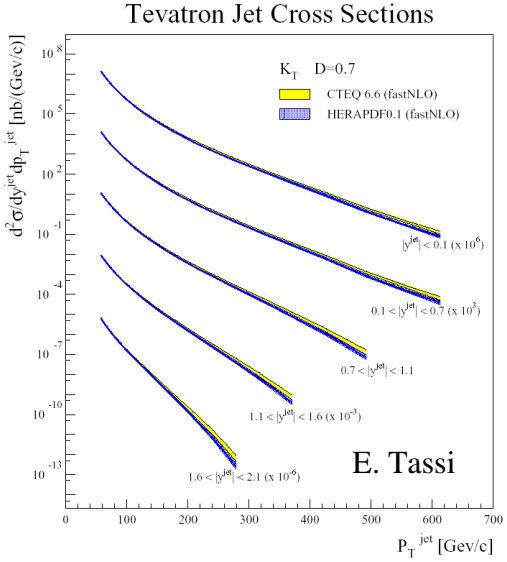


HERAPDF 0.1



LHAPDF



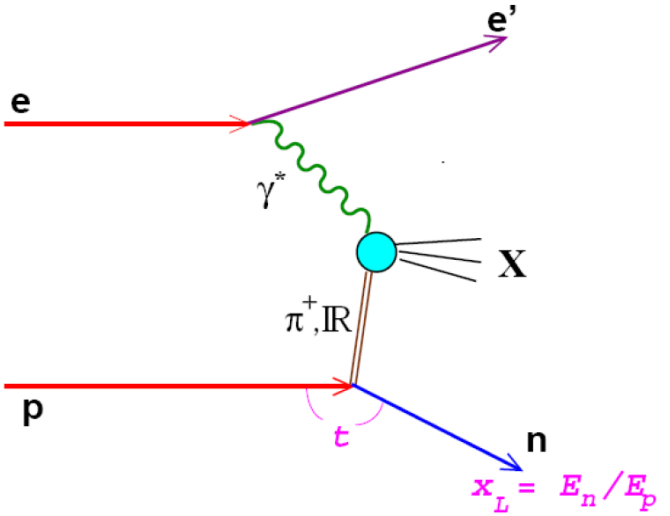


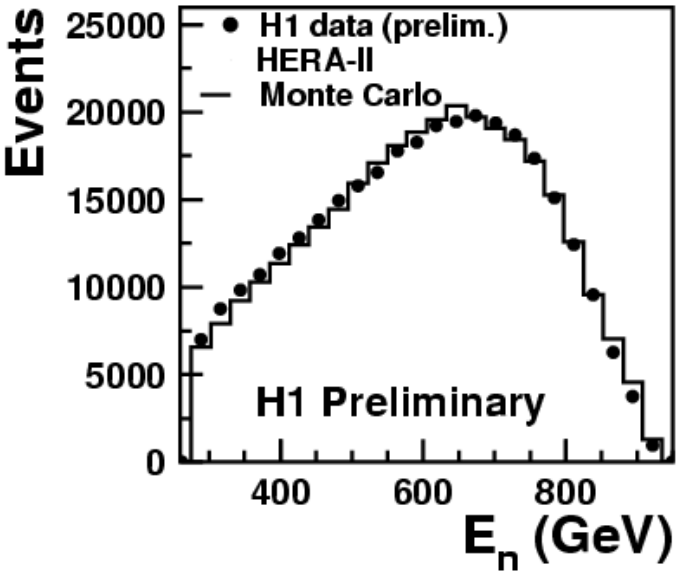
- combined fit to combined HERAI data released in April 2008 (plots)
- HERAPDF 0.1 is released within LHAPDF for common use
  - precise predictions for LHC
  - compatible at high x with jet data from Tevatron
- work on-going on improved heavy-flavour treatment

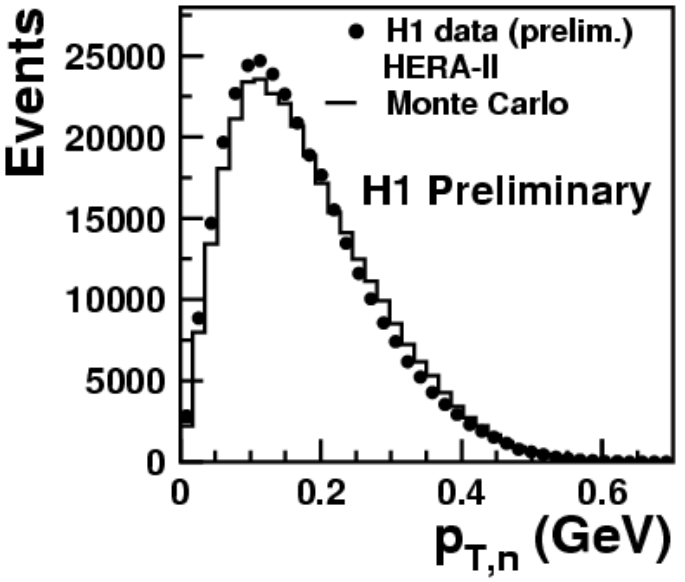
➔ HERAPDF group will actively contribute to precise predictions for LHC

Leading Neutron production in DIS

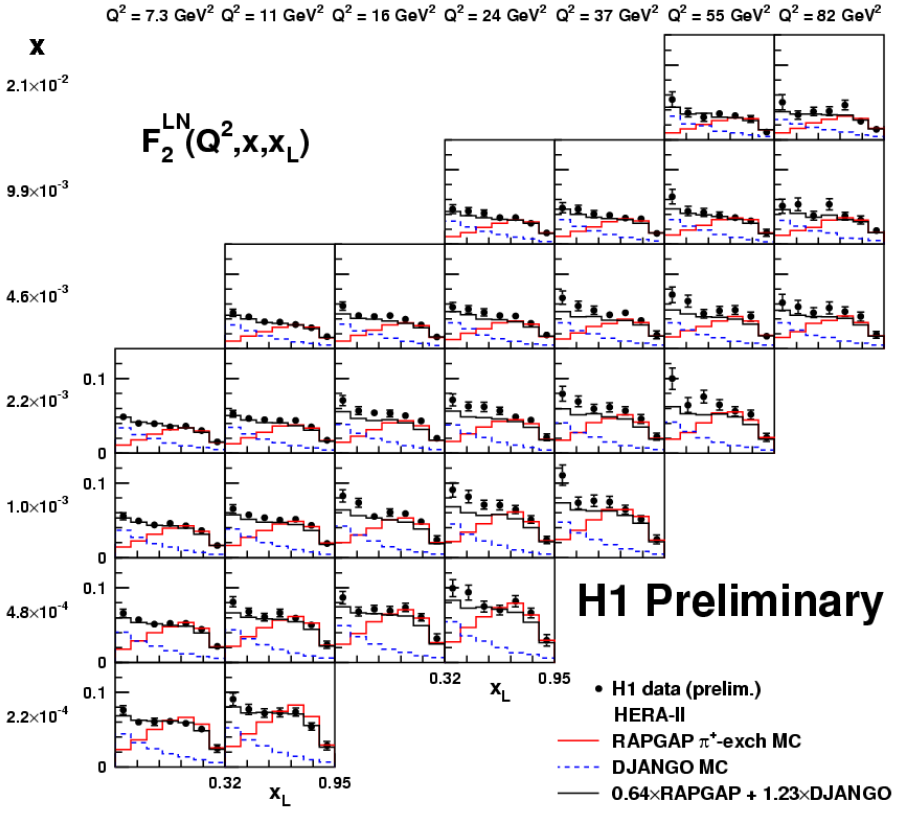
- tagged by neutron in Forward Neutron Calorimeter
- 35 times larger statistics compared to HERAI inclusive leading neutron publication







Leading Neutron production in DIS

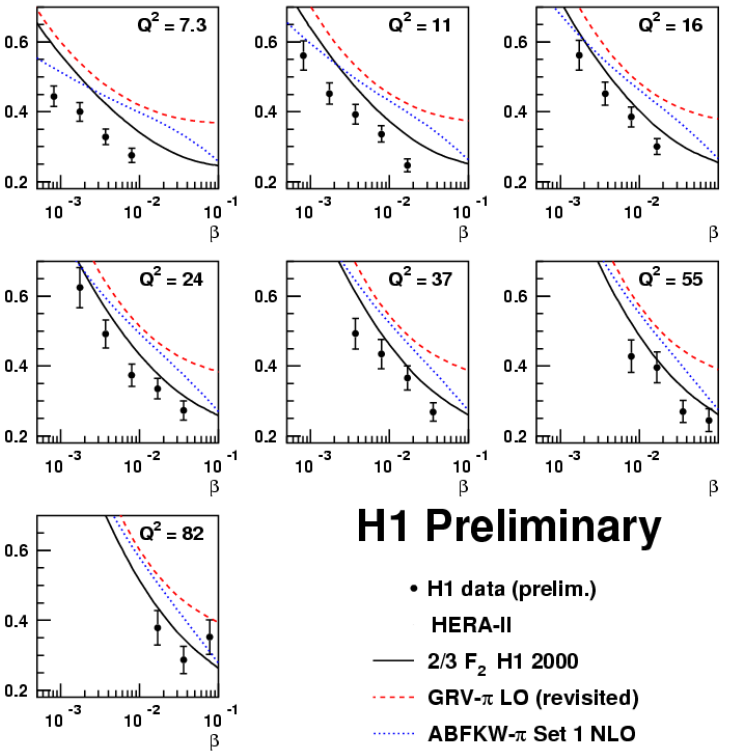


- large x_L can be described by pion exchange

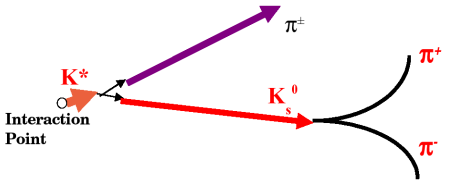
➔ sensitive to pion structure

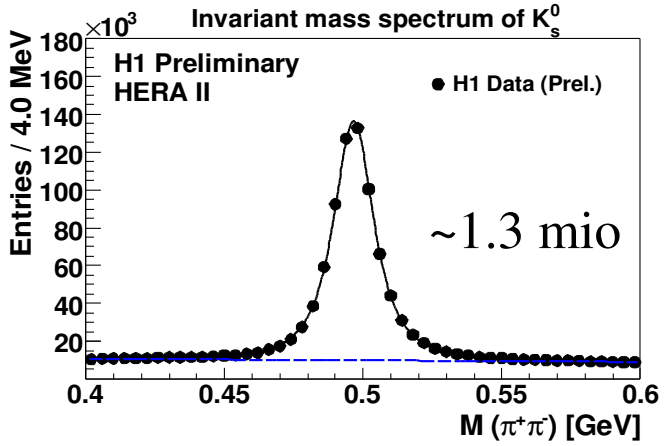
- with pion flux Γ_π the ratio F_2^{LN}/Γ_π can be associated to the pion structure function

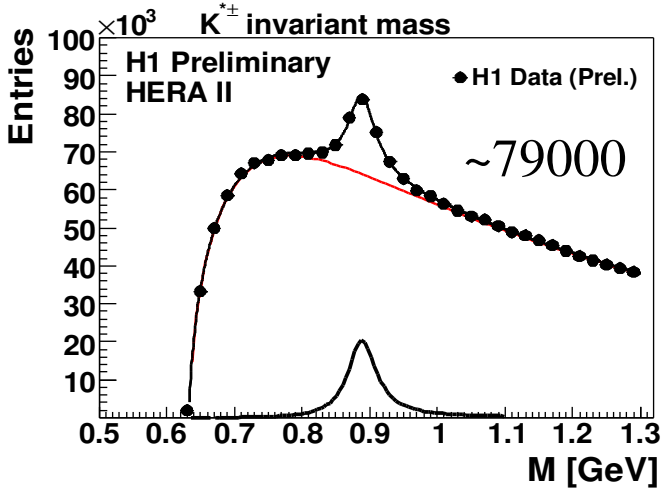
$F_2^{LN(3)}(x_L = 0.73)/\Gamma_\pi$, $\Gamma_\pi = 0.131$

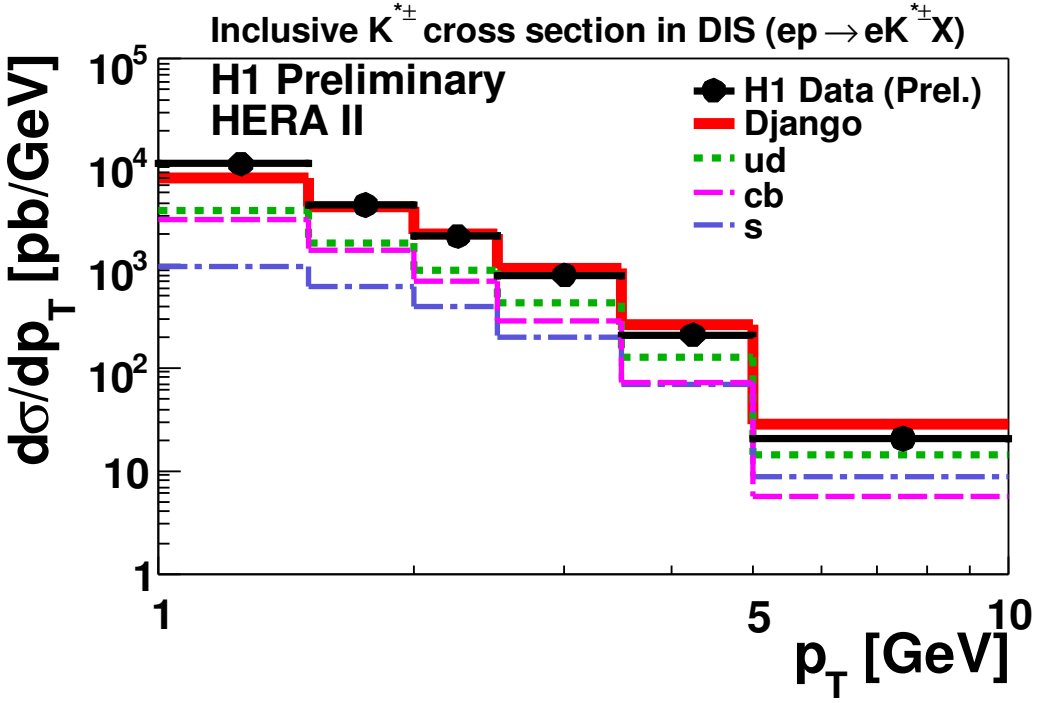


$K^{*\pm}$ production at low Q^2





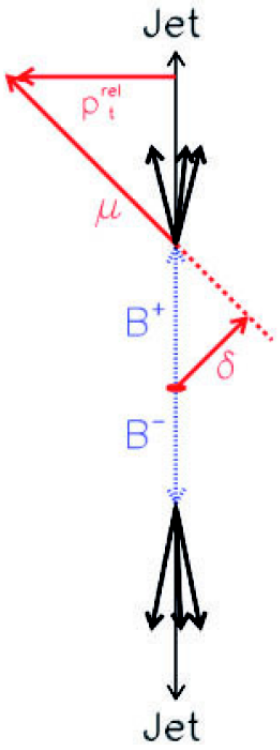




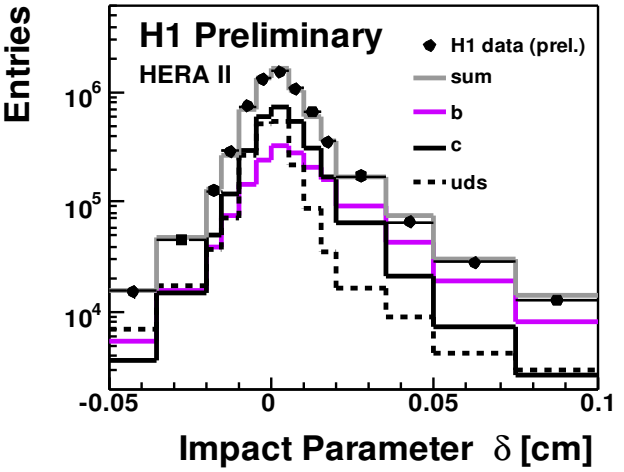
- large strangeness sample
- $K^{*\pm}$ production dominated by fragmentation of light quarks

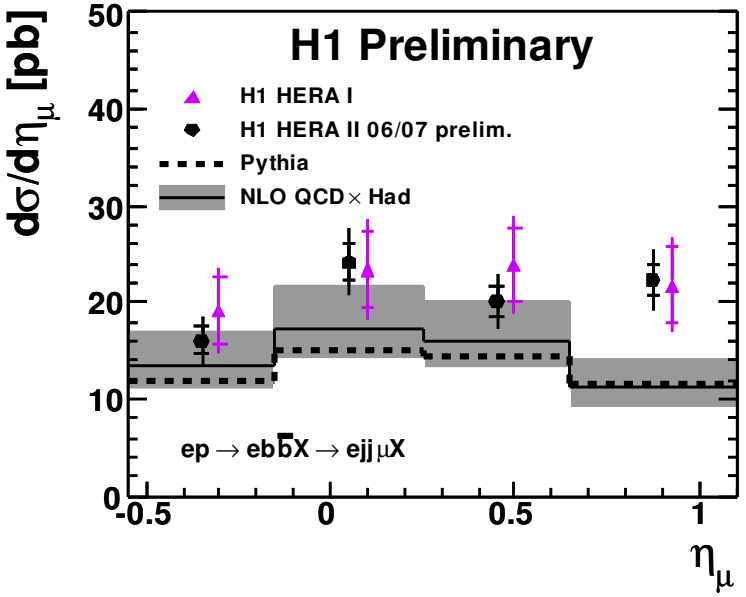
➔ sensitive to fragmentation models

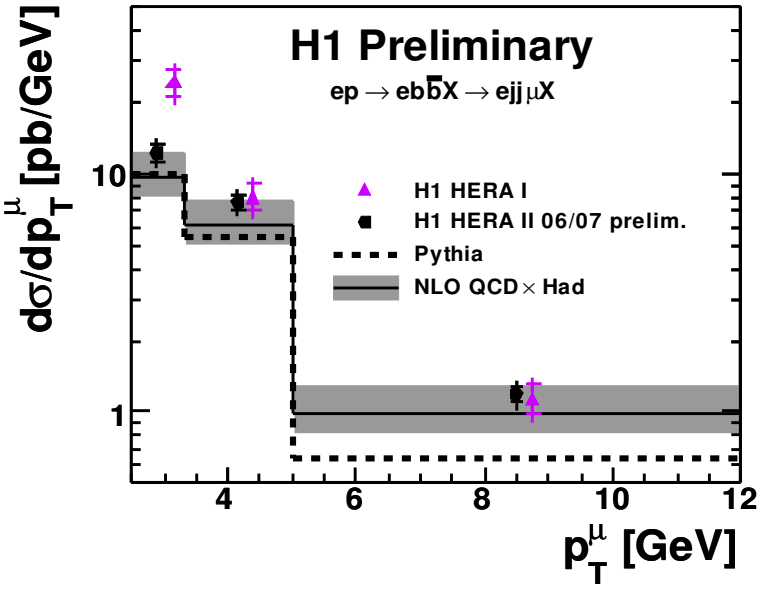
A Measurement of Beauty Photoproduction Through decays to Muons and Jets at HERAII



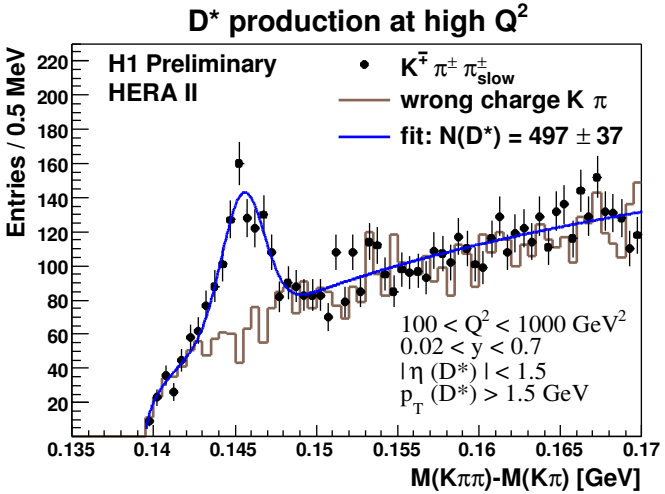
- combine mass (p_T^{rel}) and lifetime (δ) information
- precision much improved
- ➔ large excess at low p_T^{μ} not confirmed



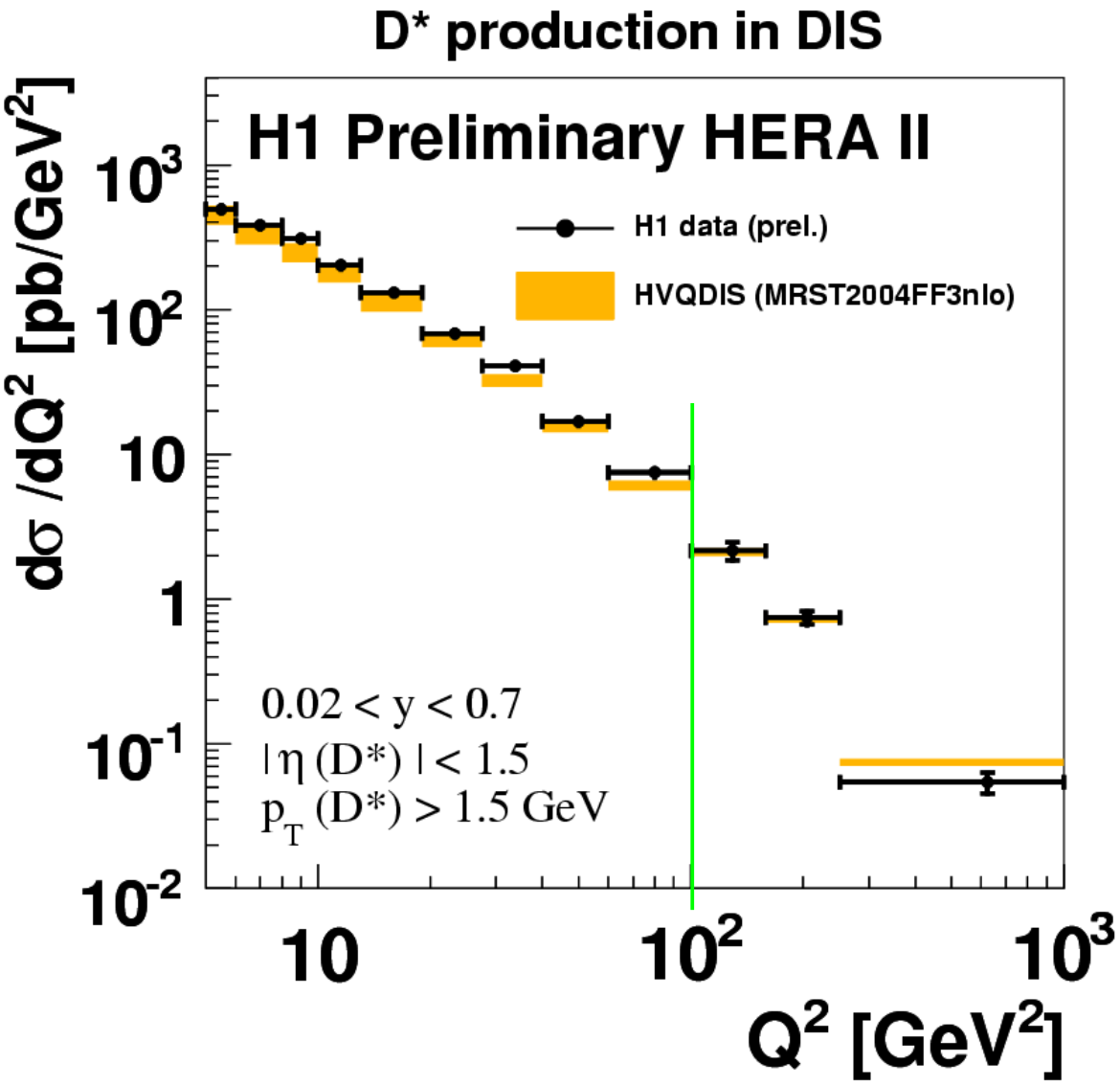




$D^{*\pm}$-Meson Production at Large Q^2

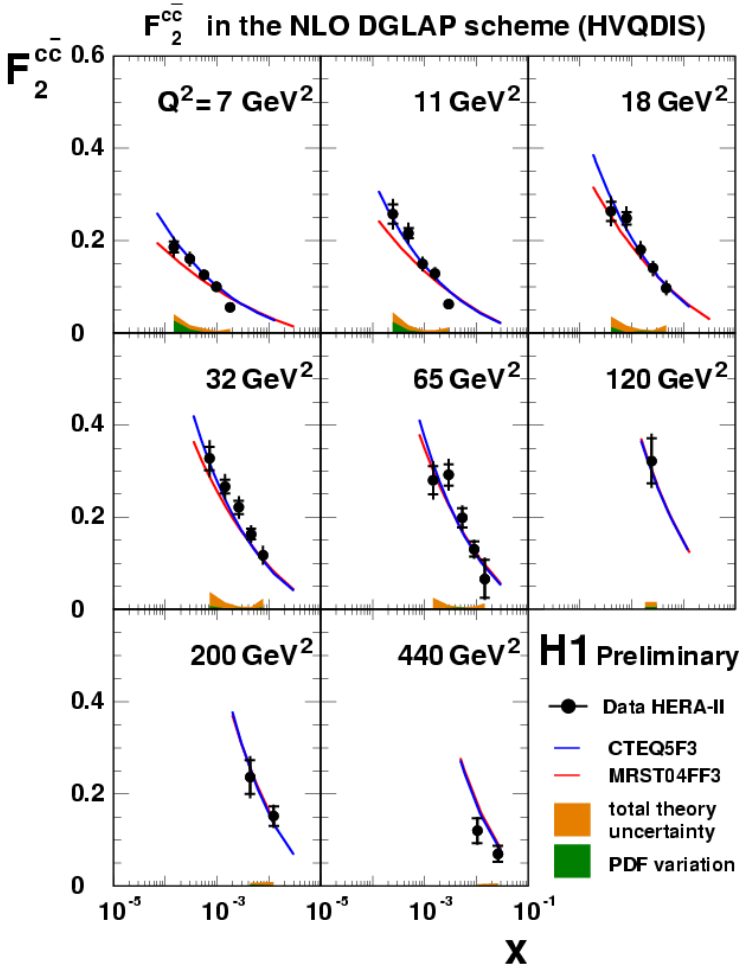


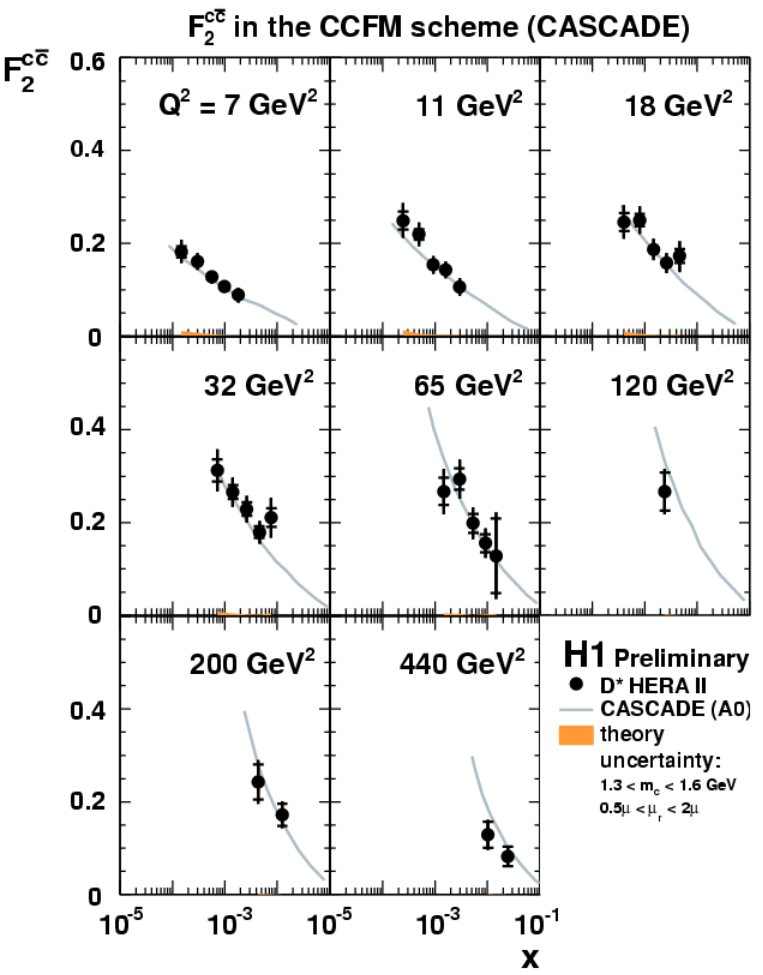
- first H1 $D^{*\pm}$ analysis for Q^2>100 GeV^2
- described by NLO QCD (HVQDIS)



Extraction of the Charm Contribution to the Proton Structure Function F_2^c from $D^{*\pm}$ Measurements

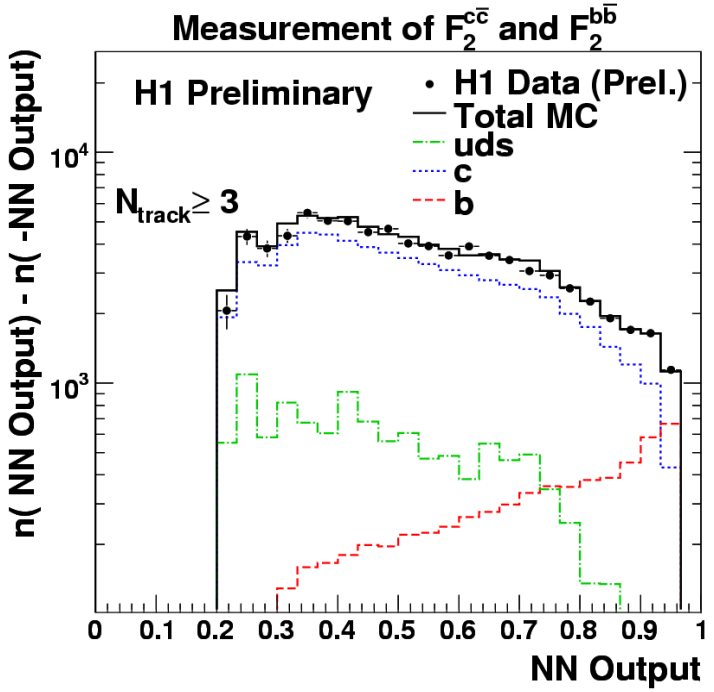
- $D^{*\pm}$ cross section as function of x and Q^2 converted to F_2^c
- extrapolation depends on theoretical model and theory parameters

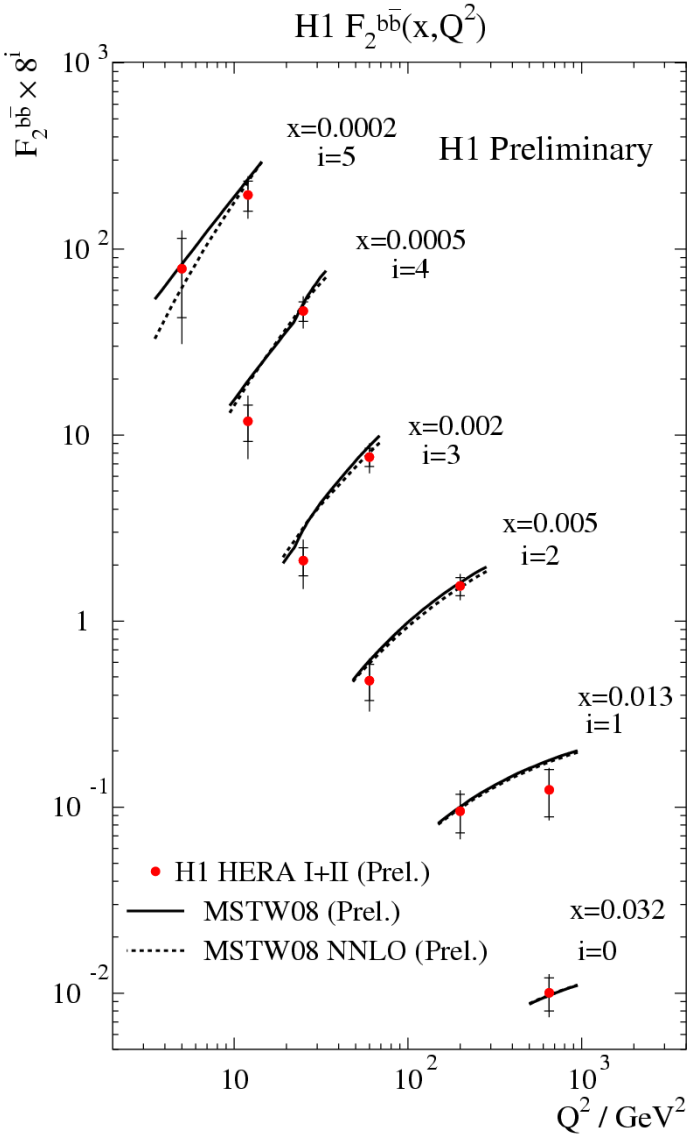




Measurement of F_2^c and F_2^b using the H1 Vertex Detector at HERA

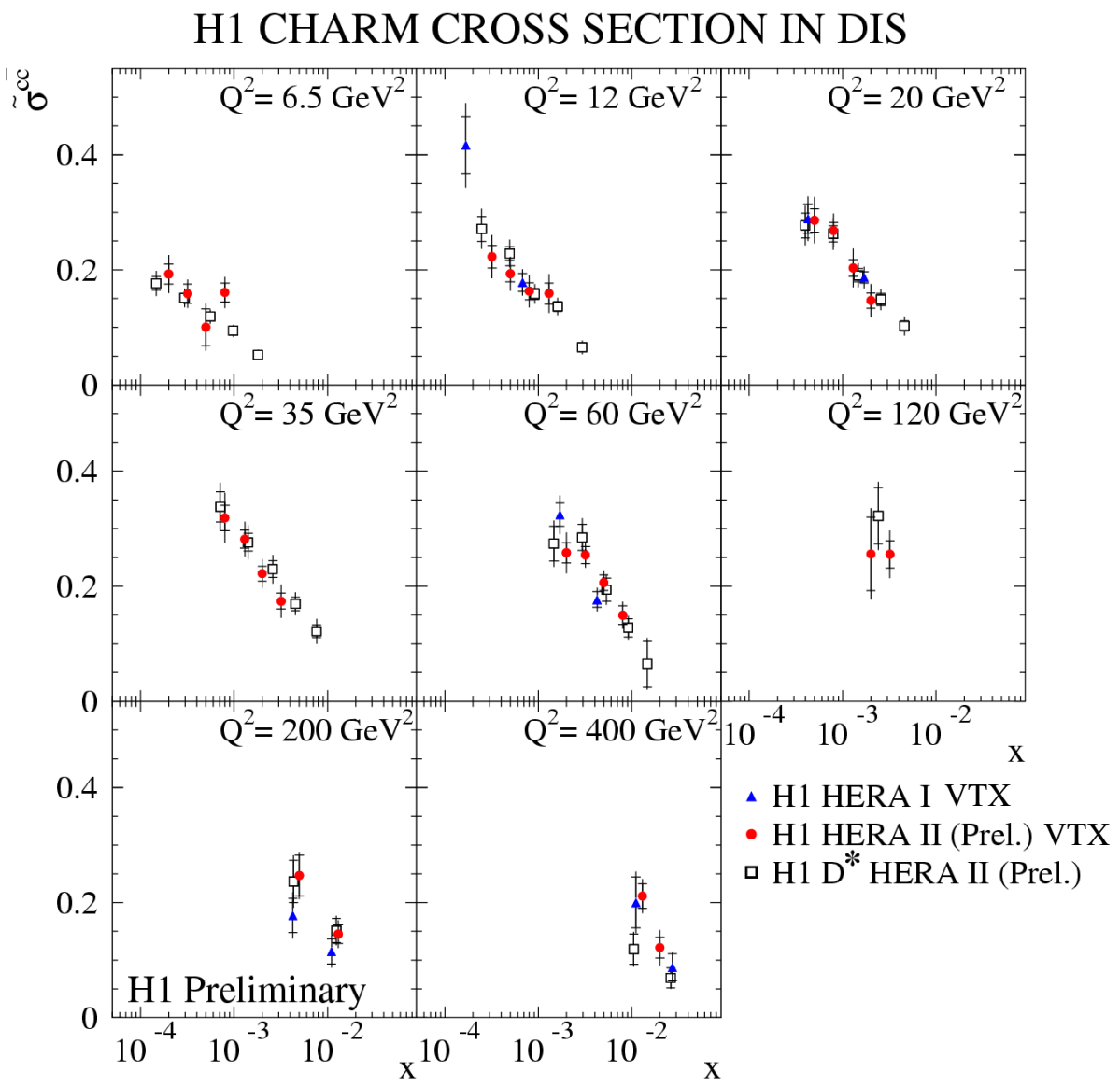
- small extrapolation: uses all tracks with hits in Central Silicon Tracker
- improved separation power: uses neural net for events with ≥ 3 tracks
- 2006+2007 data: 189 pb^{-1}



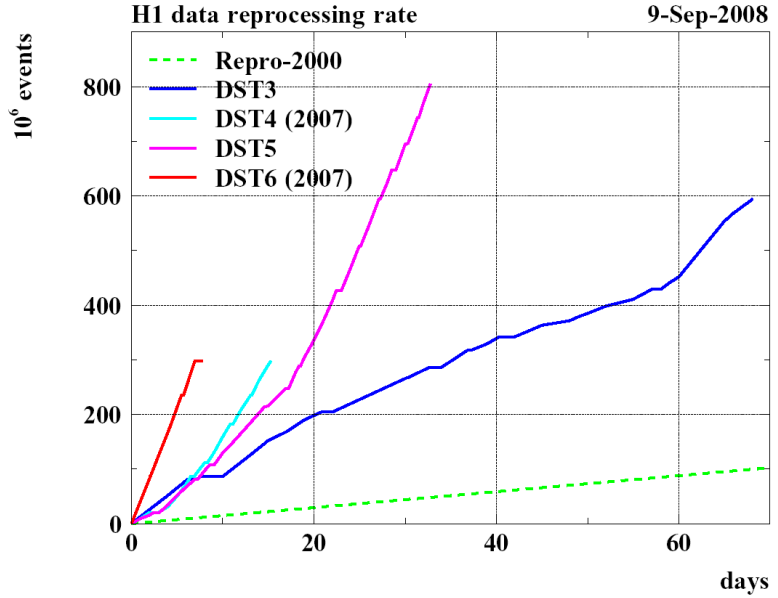


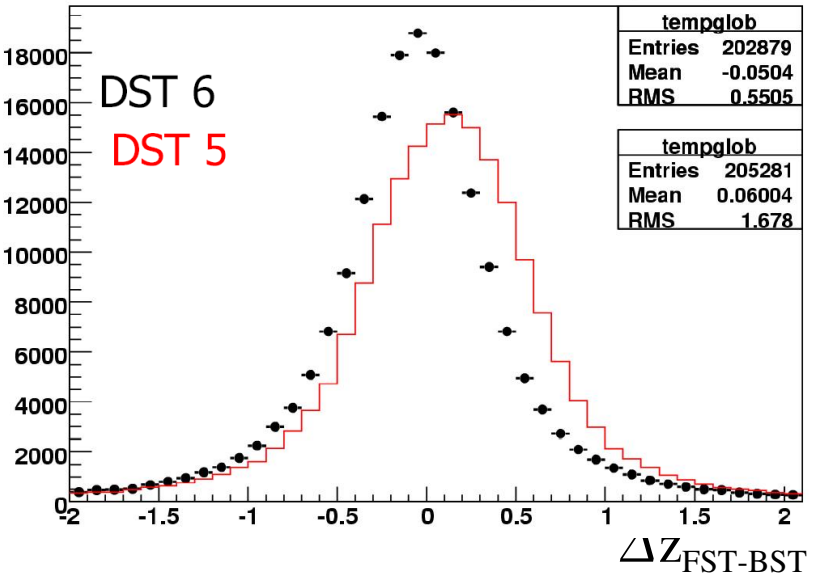
Comparison of F_2^c Measurements

- complementary measurement methods
- results in good agreement
- similar precision
- ➔ combination of both H1 measure-ments and with ZEUS planned



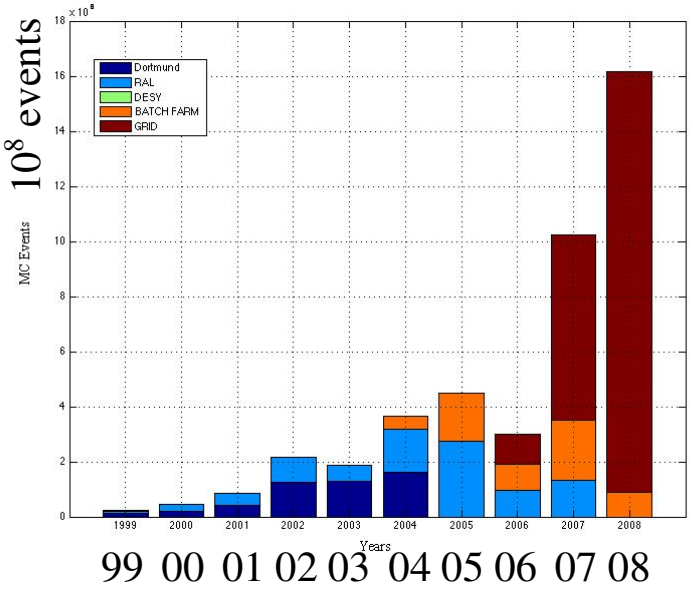
Data Processing



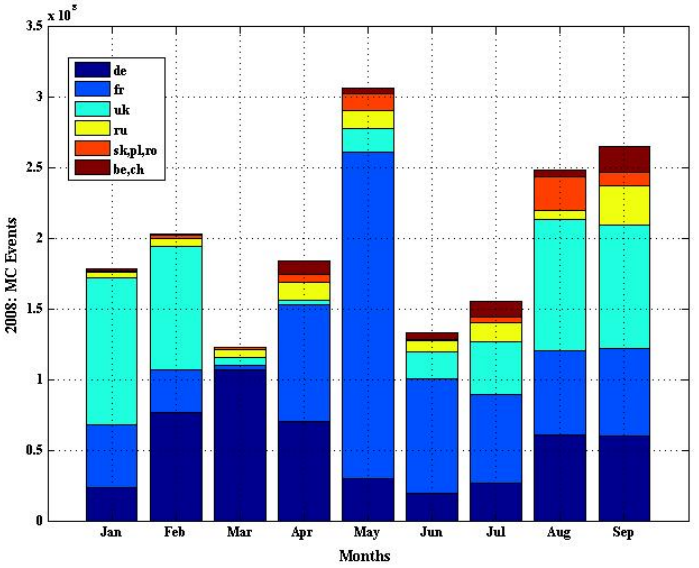


- DST6 reprocessing of 2007 data
  - for low Q^2 F_L & F_L^D analysis
  - 300 mio events in 7 days
  - improved alignment of Backward Silicon Tracker
- final DST7 reprocessing foreseen for early 2009
  - for high Q^2 and precision analyses
  - best alignment & calibration, improved forward tracks

MC Processing



1600 mio



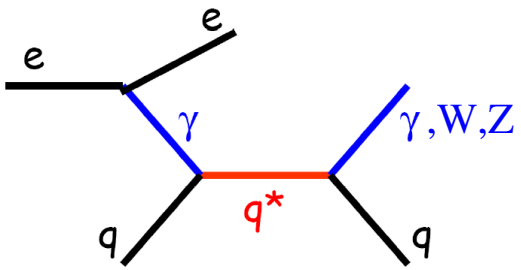
- successful transition from local MC production to grid
- 1600 mio events already produced in 2008
- production load shared between several grid sites
- 400 mio events in Sept. 2008

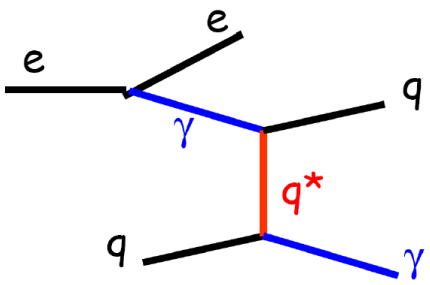
Conclusions

- many new results with HERAII data:
  - first direct measurement of F_L published
  - 8 new preliminary analyses for ICHEP (63 papers)
    - large data sample with tagged forward neutron in FNC
    - large strangeness sample
    - precise complementary charm measurements
  - inclusive and final state analyses benefit from improved statistics and systematics
- (H1+ZEUS combined) searches and PDFs from HERAI data in time for LHC
- QCD analyses & precision results (PDFs, α_s) will follow

Backup

Search for excited quarks at HERA





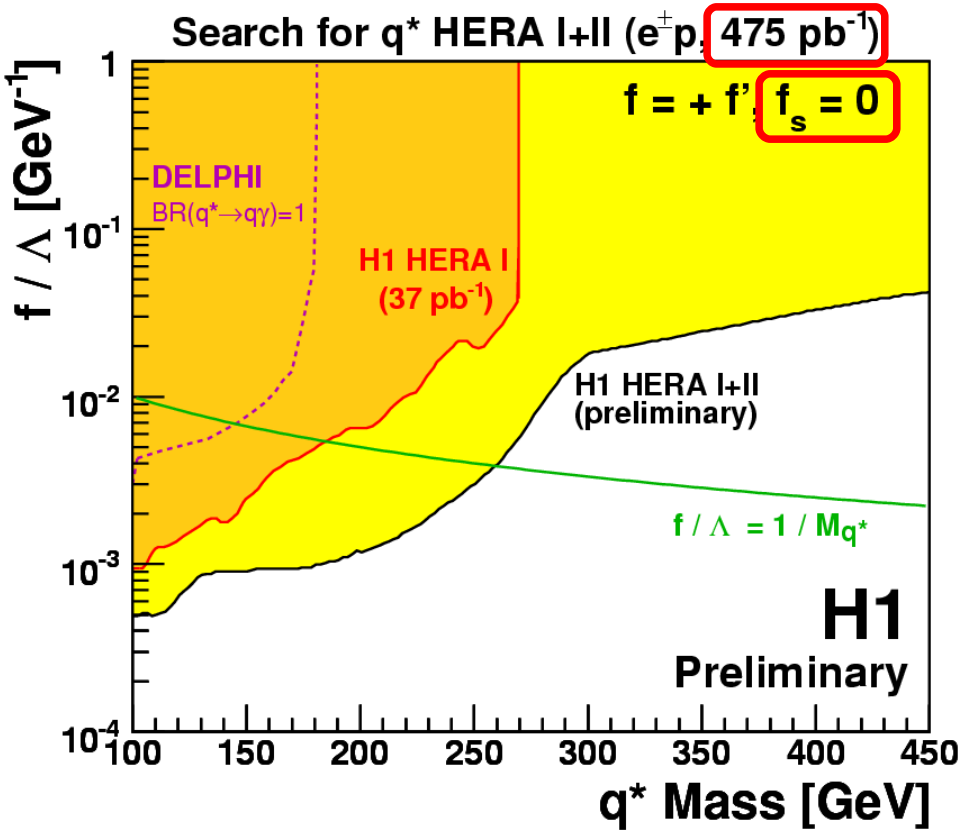
- full HERA statistics (475 pb^{-1})
- completes searches for excited fermions
- for $f/\Lambda = 1/M_{q^*}$: $M_{q^*} < 259$ GeV excluded

$q^* \to q\gamma$

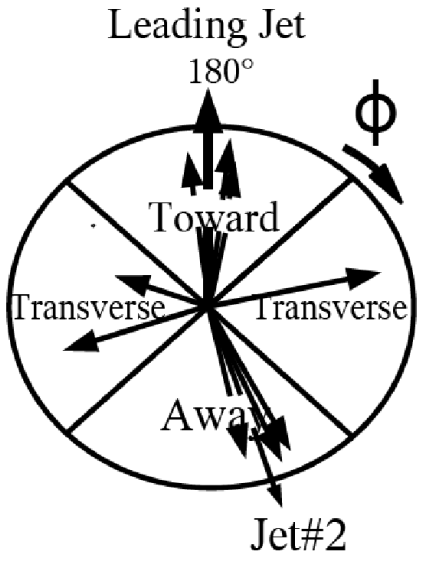
$q^* \to qW \to q\mu\nu$ or $\to qe\nu$

$q^* \to qZ \to q\mu\mu$ or $\to qee$

$q^* \to qW(Z) \to qqq$

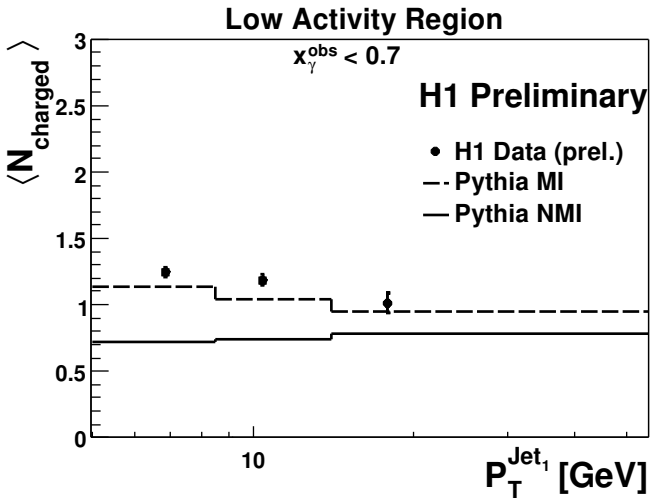


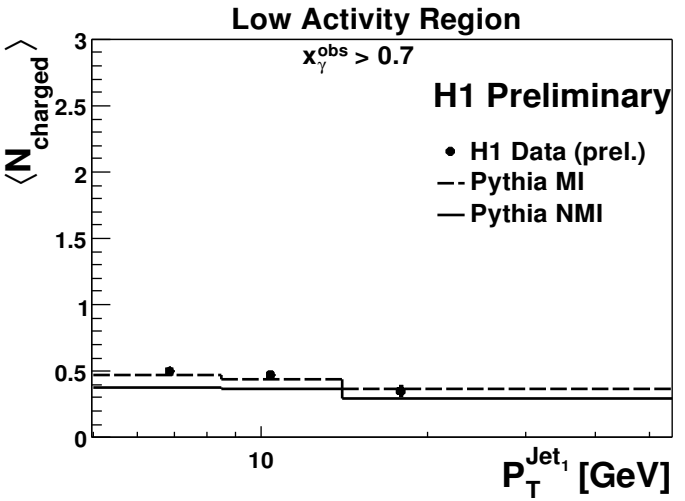
Multiple Interactions in photoproduction



- study different regions in dijet events:
  - toward: close to leading jet
  - away: close to second jet
  - transverse: between jets
    - low activity
    - high activity
- use x_γ to separate resolved and direct γ interactions

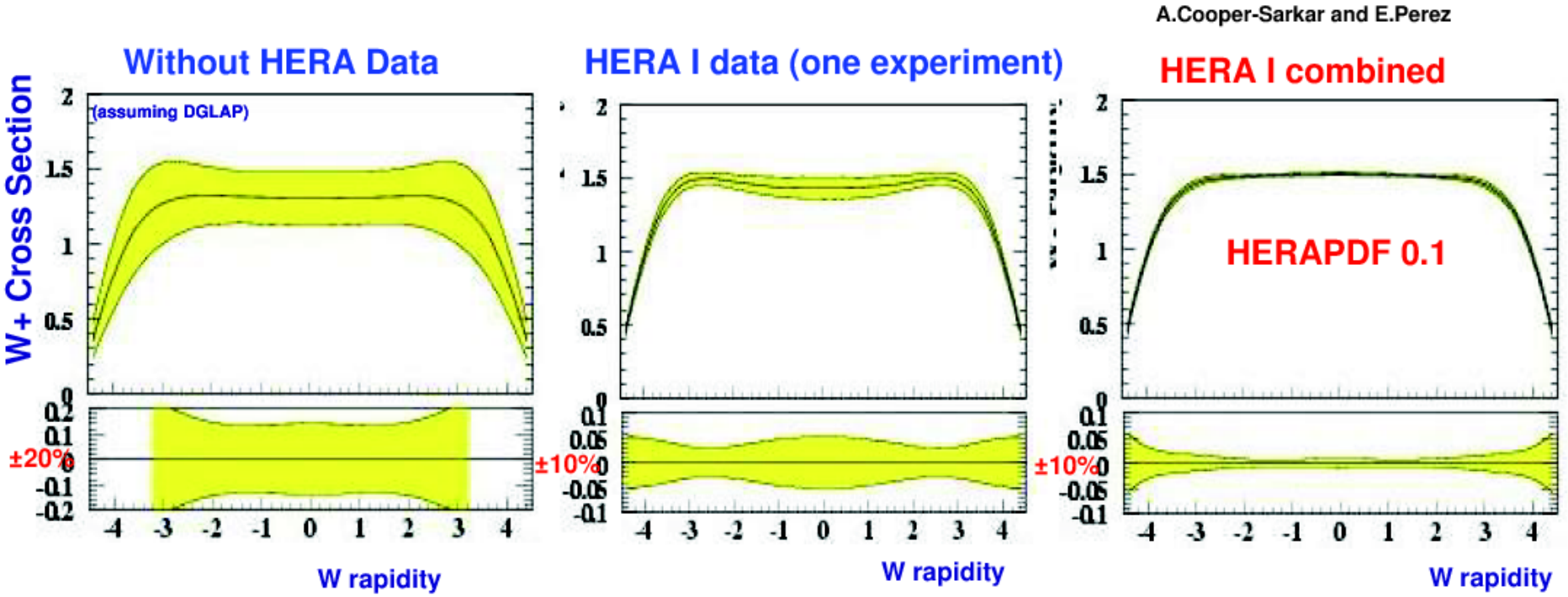
➔ sensitive to multiple interactions





HERAPDF 0.1

predictions for W boson production at LHC



- HERAPDF 0.1 can be used for predictions at other colliders
- only experimental errors shown (no model uncertainty)

➔ experimental errors significantly reduced