

Using JetWeb to relate HERA - LHC

Achim Geiser, DESY Hamburg
+ O. Gutsche and the JetWeb team



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STATUS REPORT

- reminder:
 - introduction to JetWeb
 - application to beauty production
- extension to HERA-LHC: status & plans
 - implementation of HERA reference cross sections
 - prospects for LHC

reminder: JetWeb

- JetWeb = public WWW interface and database for MC tuning and validation: <http://jetweb.hep.ucl.ac.uk> based on HZTOOL
 - interface to MC generators (currently PYTHIA and HERWIG)
 - allows parameter selection for MC generation
 - generates MC events and applies cuts (phase space, etc.) to describe implemented results **for different colliders and experiments**
 - displays data-MC comparison plots

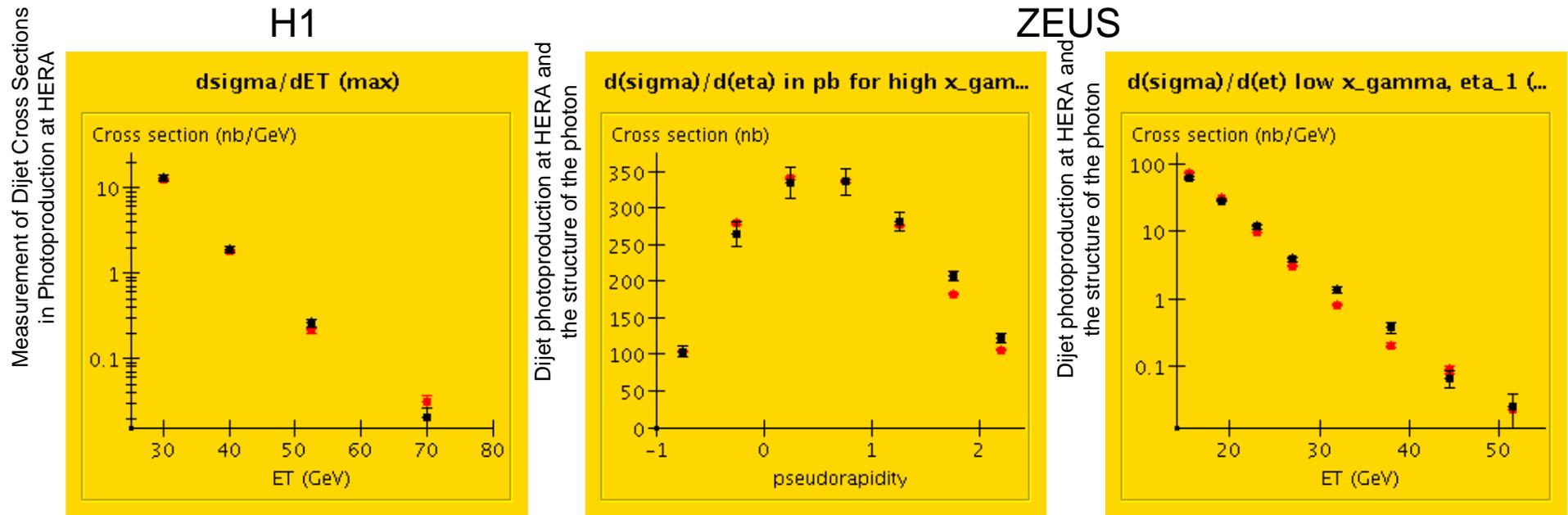
The image shows two screenshots of the JetWeb website. The left screenshot displays the search interface, titled 'Search the JetWeb database'. It includes a search bar, a 'Get results' button, and a section for 'Common parameters' with checkboxes for 'Generator' (Herwig v6.400, Herwig v6.310, Pythia v6.206), 'Photon PDF' (GRVLO, SaS1D, SaS2D, WHIT2), and 'Underlying event model' (Integer 0-5). The right screenshot shows a specific result page titled 'Measurement of beauty photoproduction at HERA'. It includes the ICHEP02 abstract 785, the author's name (Oliver Gutsche), and a plot titled 'Cross section vs x_gamma'. The plot shows data points (black) and a model fit (red) for the cross-section as a function of x_gamma. The y-axis ranges from 0 to 2000, and the x-axis ranges from 0.0 to 1.0. The plot includes error bars and a legend indicating that the data (black) was scaled by 1.0 and the model (red) was scaled by 1.45. Below the plot, it states 'This data is relevant for: Charm' and provides pull values for each point: [0.5] (2.377) [0.63] (15.167) (this plot not included in the fit).

Application to jets and beauty at HERA + $p\bar{p}$

J. M. Butterworth, S. Butterworth, O. Gutsche, B. Waugh

■ global scale factor:

- JetWeb results are scaled to **fit high- E_T HERA jet cross sections**, examples:



■ Generator: **PYTHIA**

- Proton PDF: CTEQ5L
- Photon PDF: GRV LO
- min. trans. momentum: 3 GeV

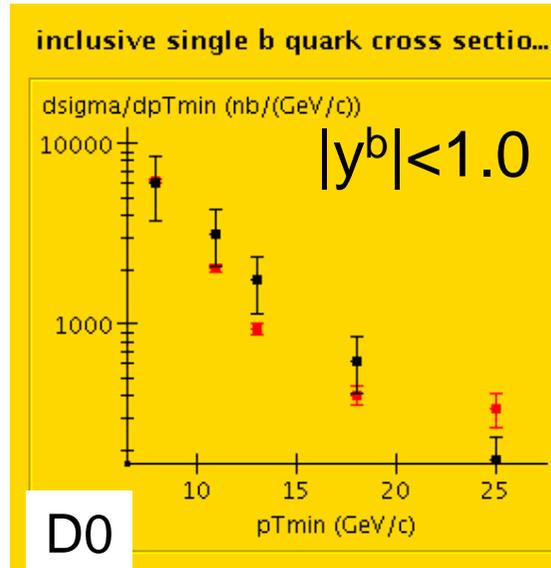
JetWeb scale = **1.45**

applied to all other plots

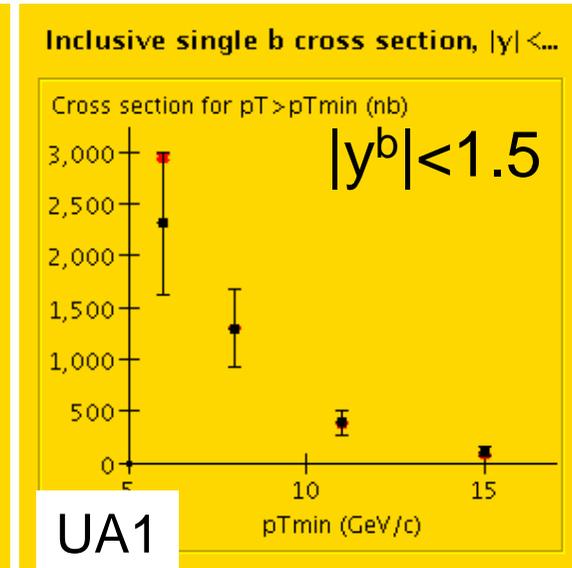
Inclusive single b cross sections

ZEUS see next page

PYTHIA



$b\bar{b} \rightarrow \mu\mu$

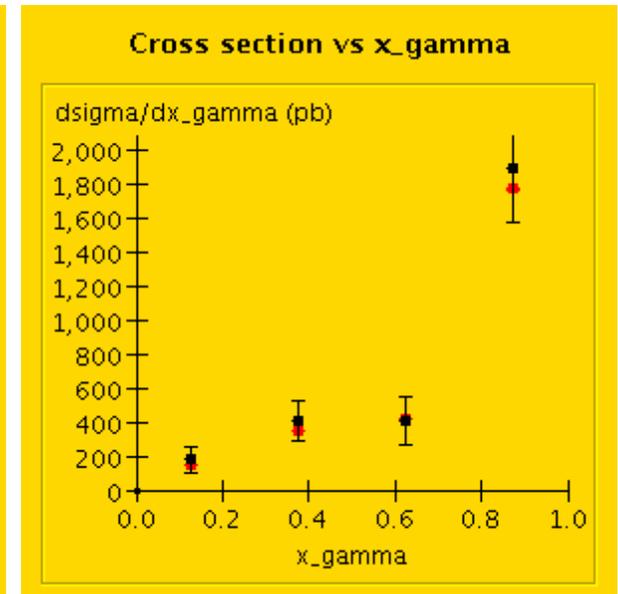
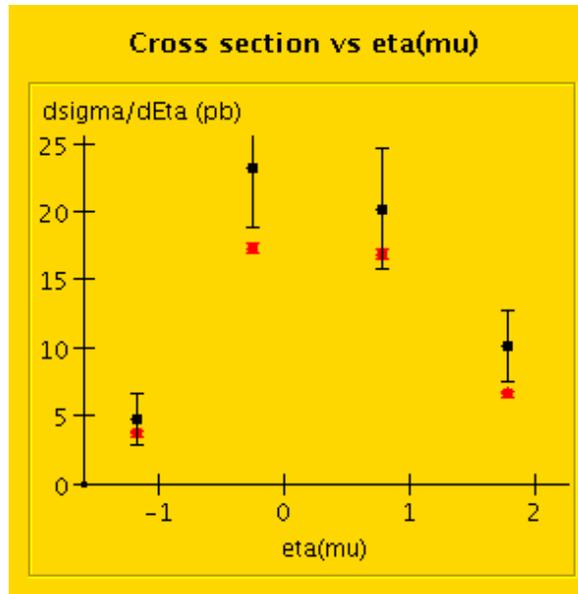
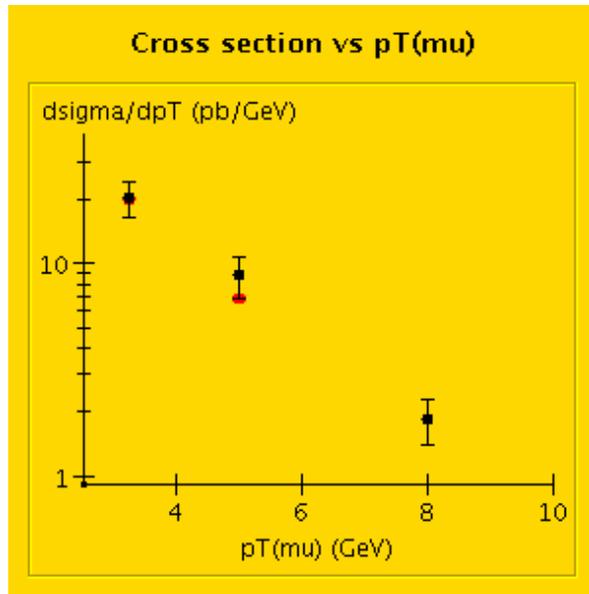


$b\bar{b} \rightarrow \mu\mu$

PYTHIA LO+PS MC (inclusive mode), scaled to HERA jet cross sections, also describes b cross sections at HERA (320 GeV ep), CERN SppS (630 GeV $p\bar{p}$) and Tevatron (1800 GeV $p\bar{p}$) !

ZEUS dijet + μ in photoproduction

PYTHIA



ZEUS „visible“ cross sections well described

no tuning needed!

for more, see talk O. Gutsche, WG meeting June 2004

Implementation of reference cross sections

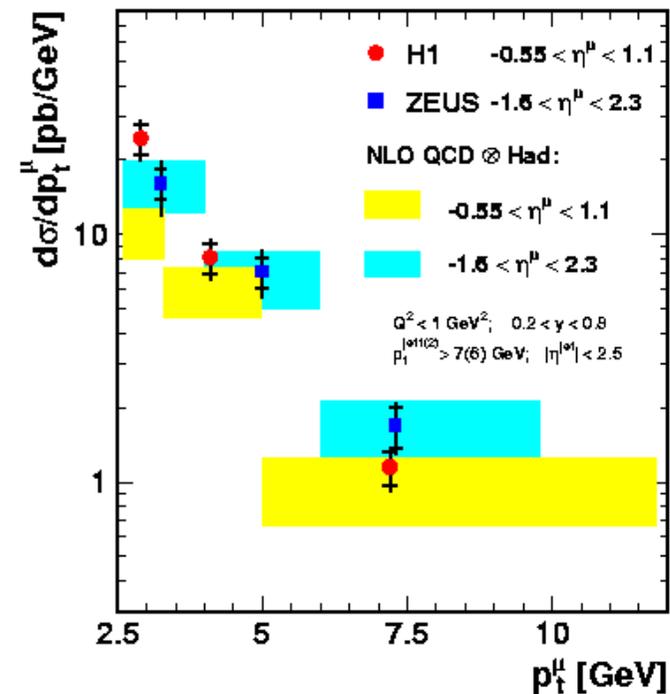
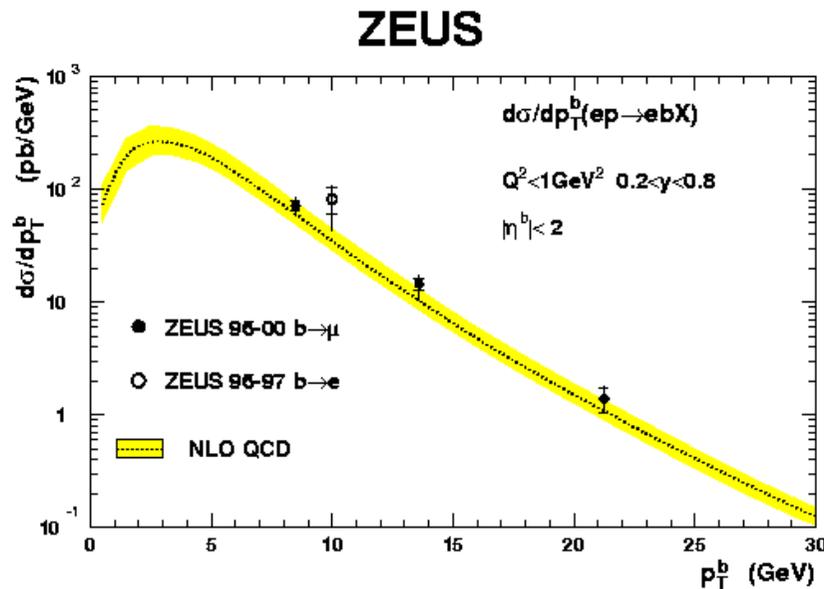
goals:

- implement HERA reference cross sections (beauty and charm) for PYTHIA (+ HERWIG) inside JetWeb
status: ongoing (very soon)
- compare to existing HERA data
 - choose appropriate binning
 - (small) extrapolation of existing measurements to phase space of reference cross sections (next slides)
 - > validate predictionsstatus: conceptually ready, implement in time for proceedings
- interface JetWeb to HZTOOL implementation of LHC cross sections (A. Dainese?)
 - > quantitative predictions for LHC, validated by HERA (and other) data

reference cross sections for beauty

$d\sigma/dp_T$ for $|\eta| < 2$ for $b, B, b \rightarrow \mu$ (photoproduction)

- use/extrapolate published muon+dijet measurements from H1 and ZEUS



- add preliminary measurements at lower p_T (if ready in time)

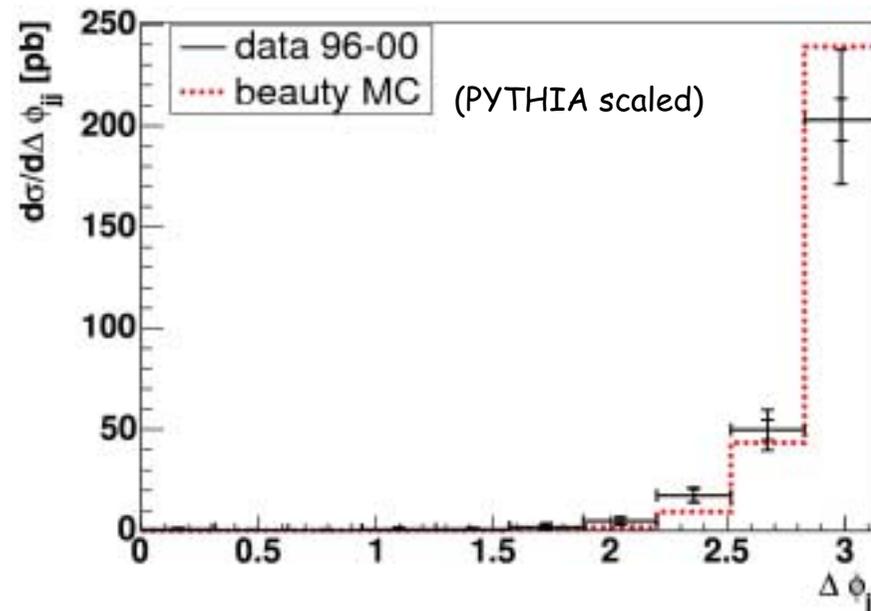
reference cross sections for beauty

$d\sigma/d\Delta\phi$ for $p_T > 2.5/6 \text{ GeV}$, $|Y| < 2$ for $b, B, b \rightarrow \mu$

- use/extrapolate muon+dijet measurements from ZEUS data

thesis O. Gutsche:

(not yet officially released by ZEUS)

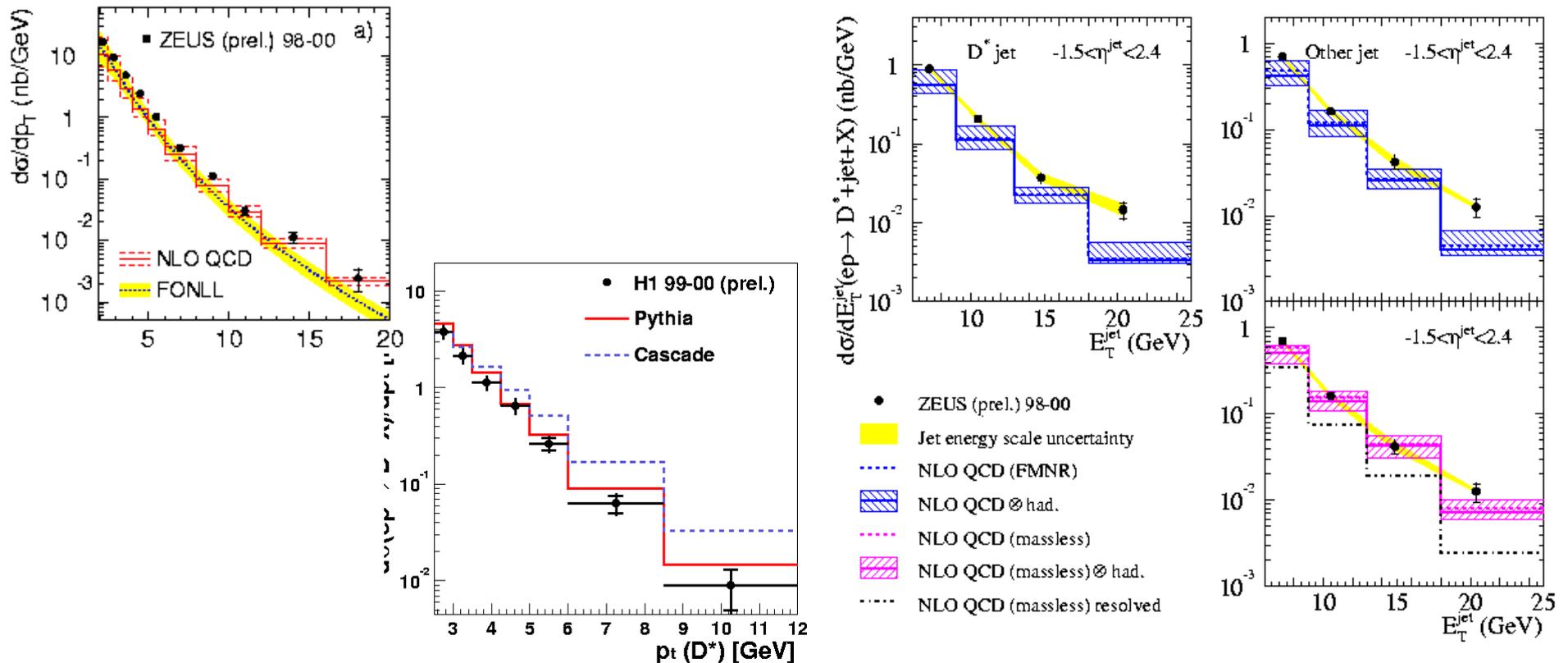


- add more measurements at lower p_T (if ready in time)

reference cross sections for charm

$d\sigma/dp_T$ for $|\eta| < 2$ for c, D (photoproduction)

- use/extrapolate existing D^* and D^*+jet measurements from H1 and ZEUS



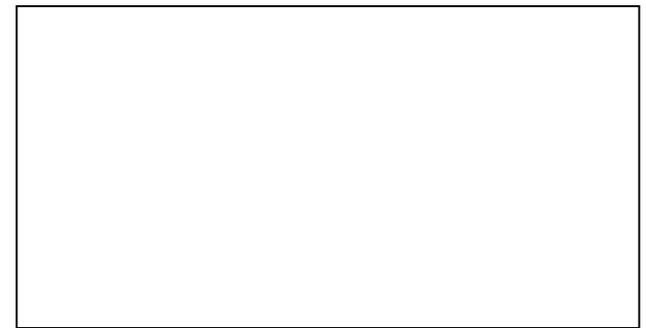
reference cross sections for charm

$d\sigma/d\Delta\phi$ for $p_T > 2.5/6 \text{ GeV}$, $|Y| < 2$ for c , D

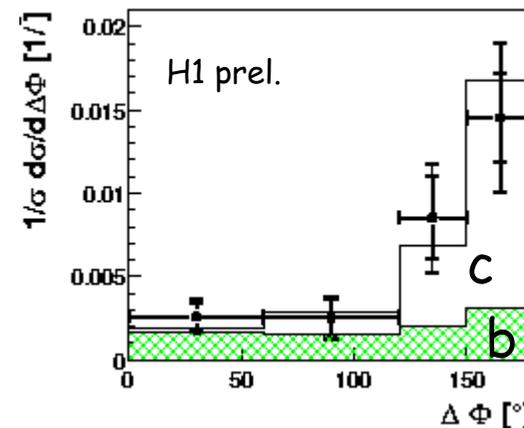
- use/extrapolate D^* +dijet measurements from ZEUS (+H1?) data
(to be released by ZEUS soon)

- add D^* + μ measurements at lower p_T ?
(H1 and ZEUS)

b/c separation non-trivial



$\Delta\phi(jj)$



Summary and Conclusions

- Work in progress ...
- PYTHIA LO+PS MC model, tuned to HERA jet cross sections via the JetWeb interface, simultaneously describes jet and b cross sections at HERA, Tevatron, and CERN Sp \bar{p} S
-> expect reliable predictions for LHC
- HERA-LHC reference cross sections (beauty + charm) are being implemented in JetWeb
Will (hopefully) be validated using selected HERA results
- results + LHC predictions can then also be compared to reference cross sections from other QCD calculations (e.g. NLO, ...)