

Report from ZEUS

DESY PRC meeting, Zeuthen, 1. 10. 08



Achim Geiser, DESY Hamburg



- papers and preliminaries)
- physics highlights) since last PRC
- dismantling status
- outlook until 2010/2014 (PoF)

Papers since last PRC, april 08

- Beauty photoproduction using decays into electrons at HERA
DESY-08-056, May 2008, to be published in PRD
- $K_S^0 K_S^0$ resonance production in ep collisions at HERA
DESY-08-068, June 2008, to be published in PRL
- Search for events with an isolated lepton and missing transverse momentum and a measurement of W production at HERA
DESY-08-089, July 2008, to be published in PRL
- Production of excited charm and charm-strange mesons at HERA
DESY-08-093, July 2008, to be published in EPJ
- Angular correlations in three-jet events in ep collisions at HERA
DESY-08-100, July 2008, to be published in EPJD
- Measurement of beauty production from dimuon events at HERA
DESY-08-129, September 2008, to be submitted to JHEP
- + 3 papers (DVCS, large rapidity gap, leading proton) imminent

Preliminary results since april 08

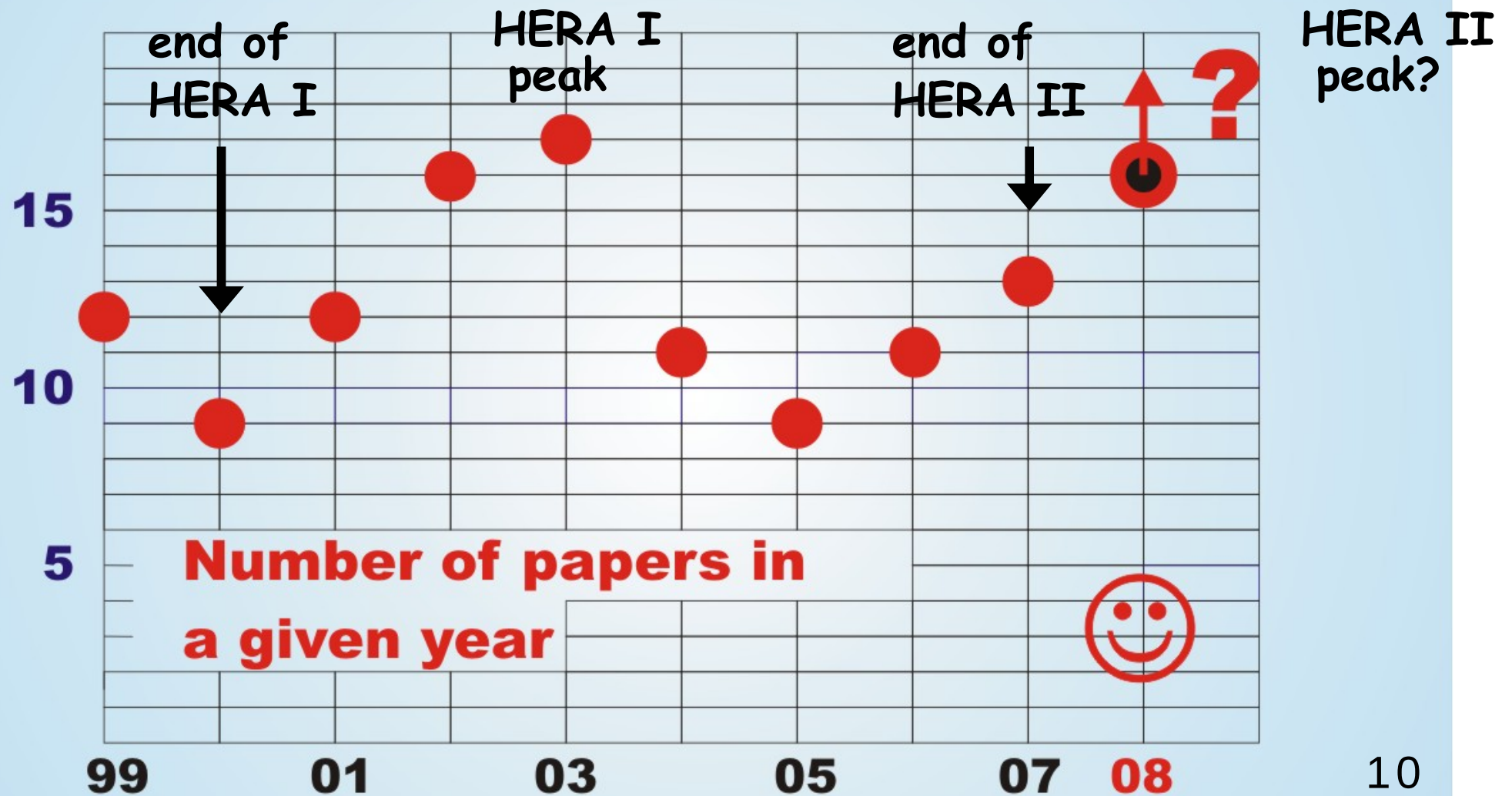
- New physics: multi-muon and di-tau search
- Electroweak: high Q^2 neutral currents
- Structure functions: F_L
- QCD: α_s from inclusive jets in photoproduction
- Heavy flavours: Charm and Beauty in DIS from muons

H1-ZEUS combination:

- updates on combined HERA PDF -> see H1 talk
- combined diffractive structure function

+10 additional results currently at editorial stage

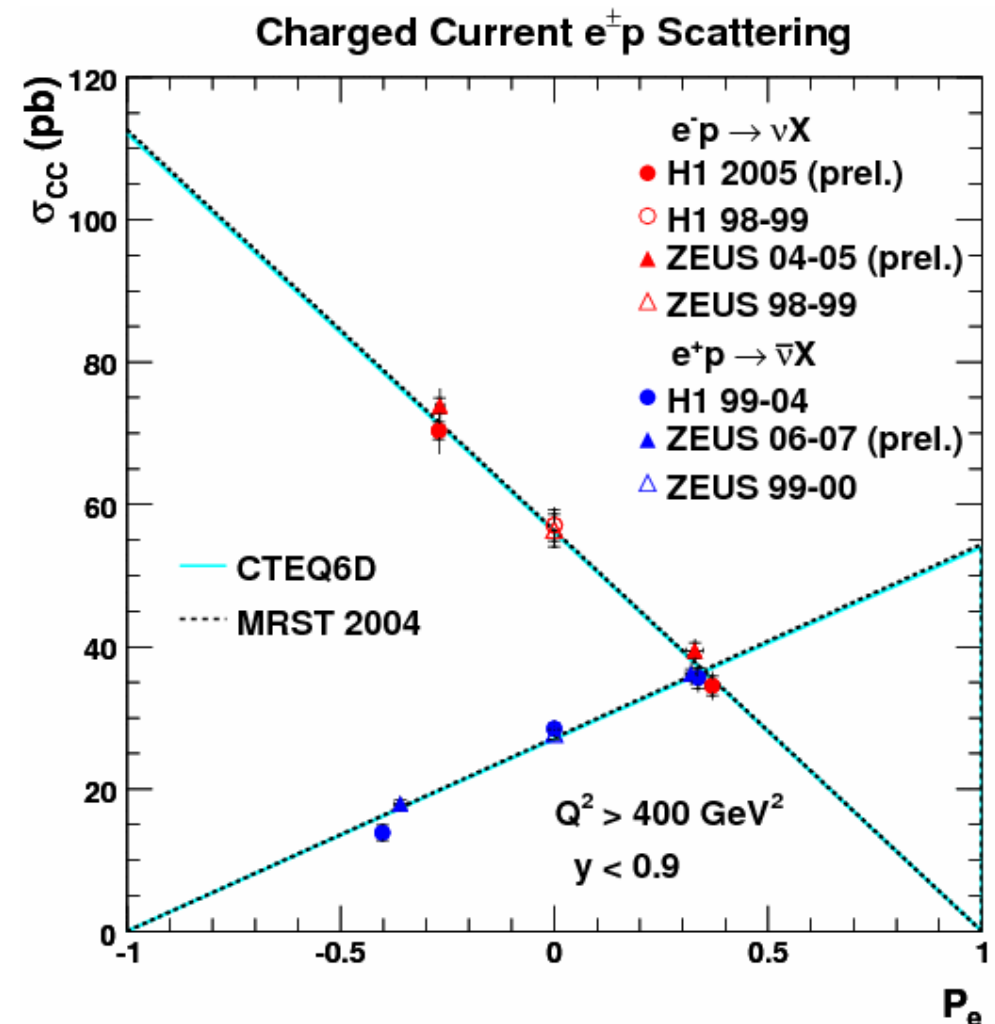
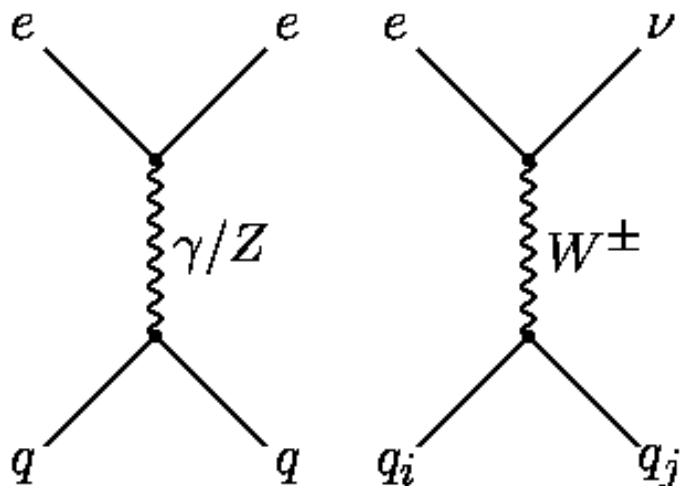
History of ZEUS papers



Electroweak and new physics

HERA losing “cutting edge” in high energy frontier to LHC soon

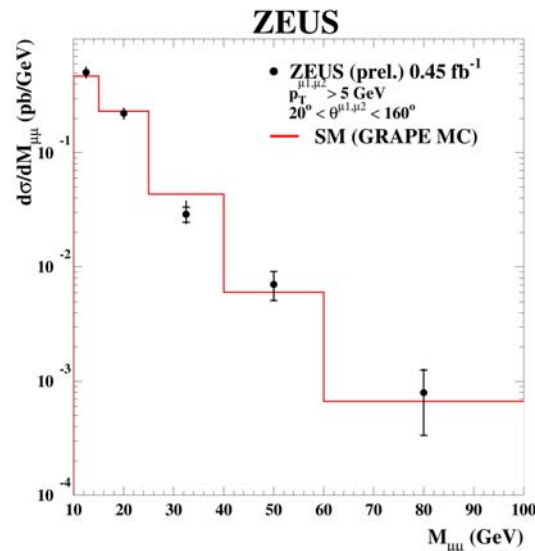
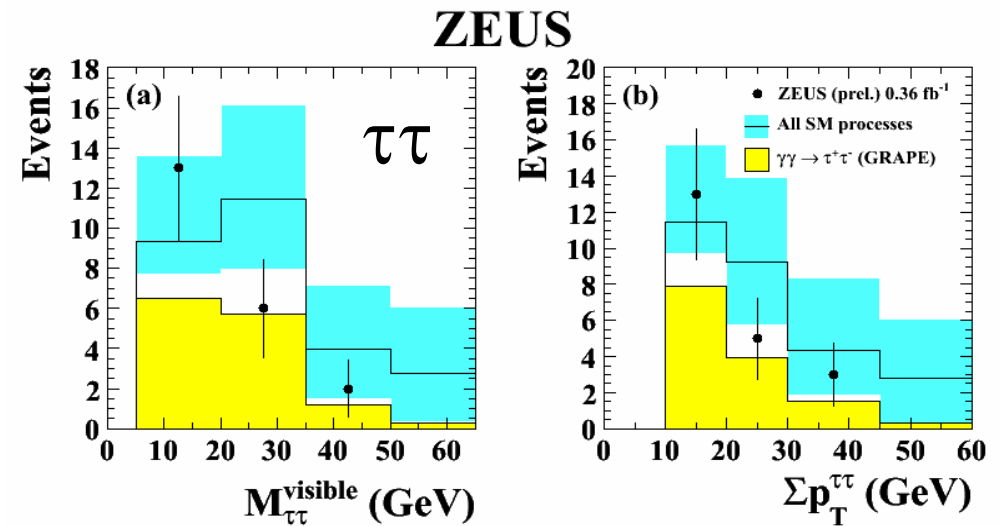
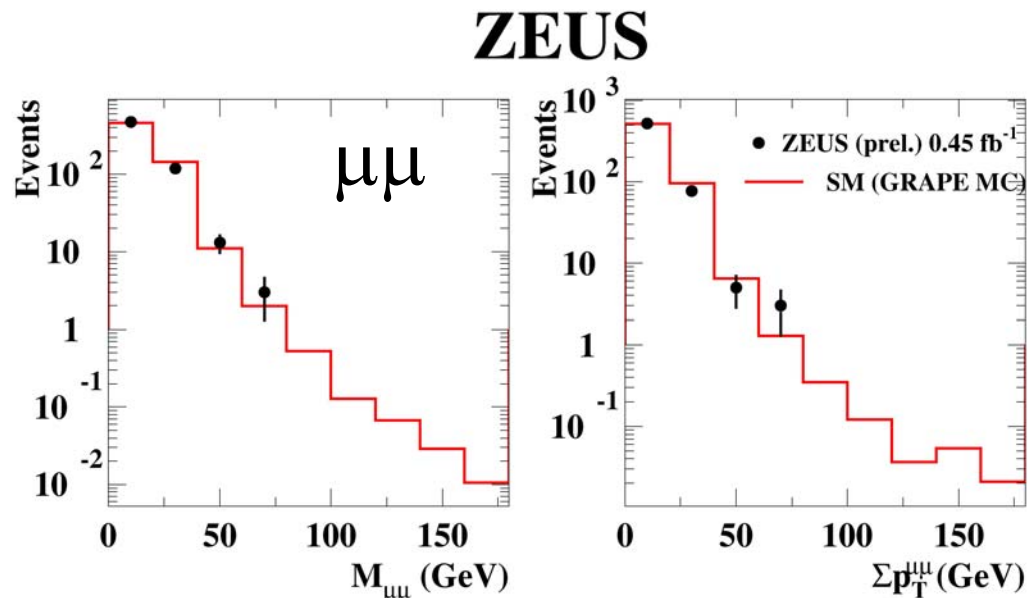
... but unique in exploring electroweak physics (and potential deviations) in spacelike domain



Isolated Multi-Muons, di-Tau

extends earlier multilepton analyses/searches

(small excess in multielectron channel by H1, ZEUS and combined OK)



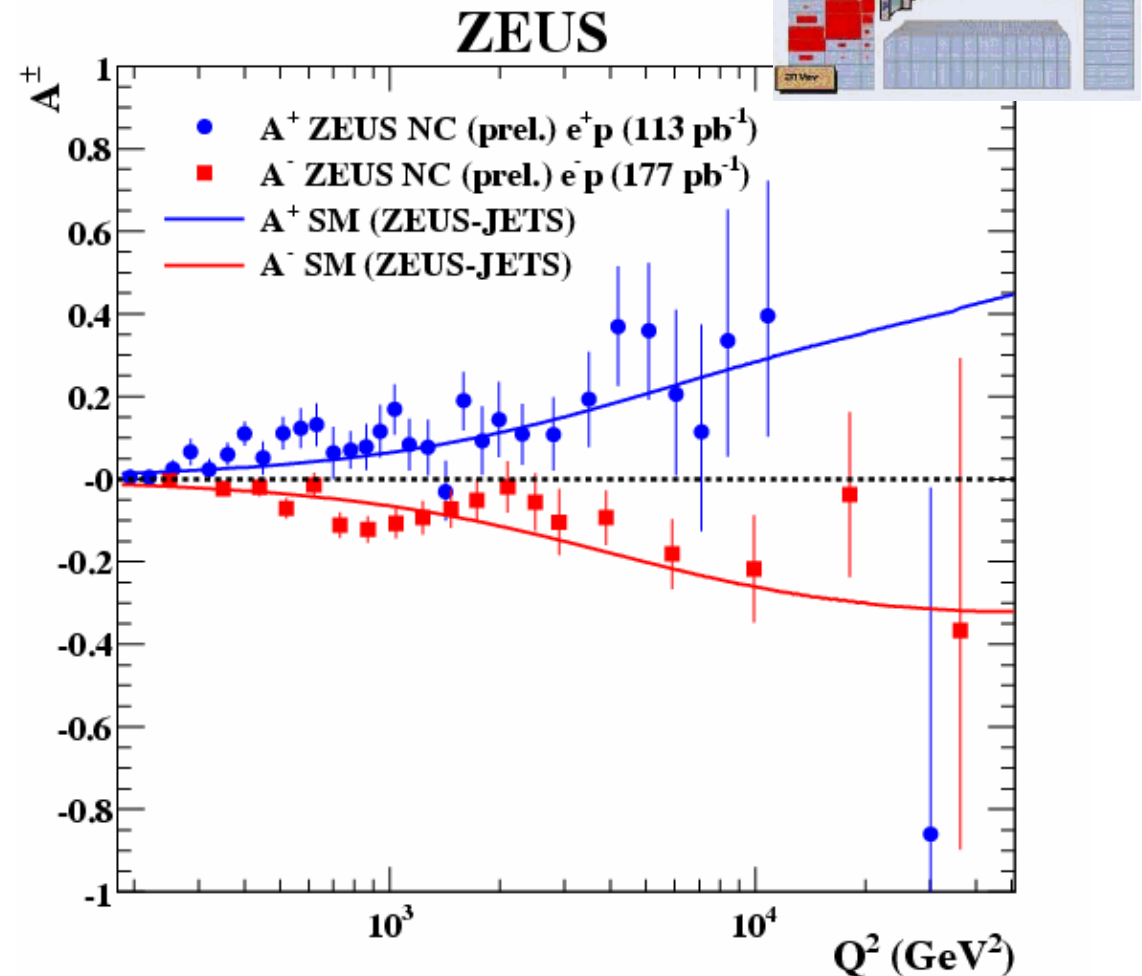
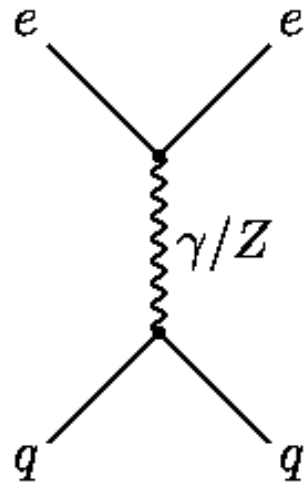
no excess w.r.t. Standard Model

general goal: complete all ongoing new physics searches by 2009

Neutral currents at high Q^2

measure cross section
asymmetry w.r.t.
polarization due to
Z exchange

Standard
Model OK



general goal: complete electroweak measurements
(including textbook measurements), combine with H1
combine with LEP?

HERA = currently best (?) QCD laboratory

■ Proton structure:

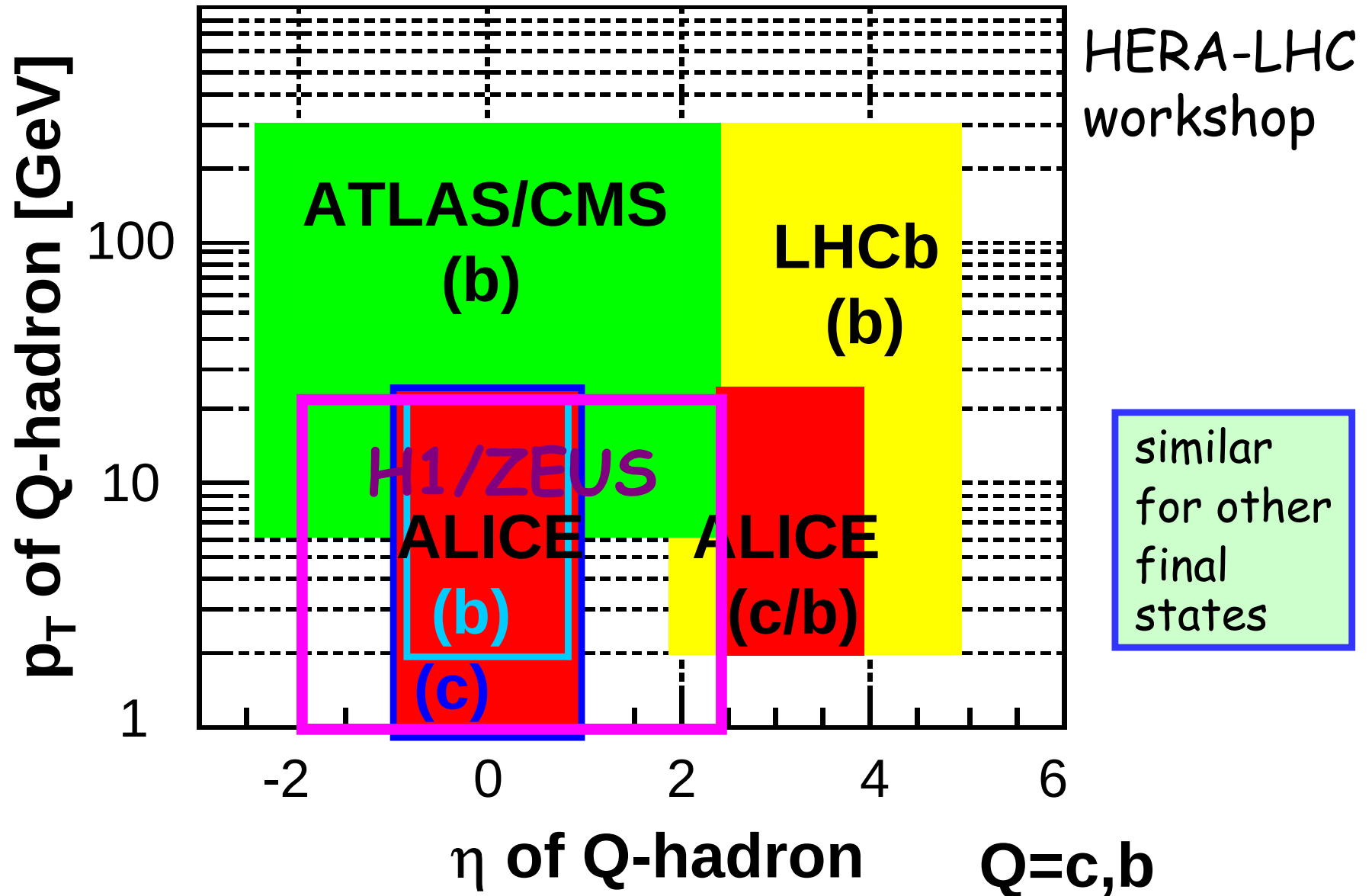
- structure functions and parton density functions (PDF)
- heavy flavours

■ General QCD studies

- jets and α_s
- semi-inclusive final states, diffraction

■ Both direct and indirect relations to measurements at Tevatron and LHC

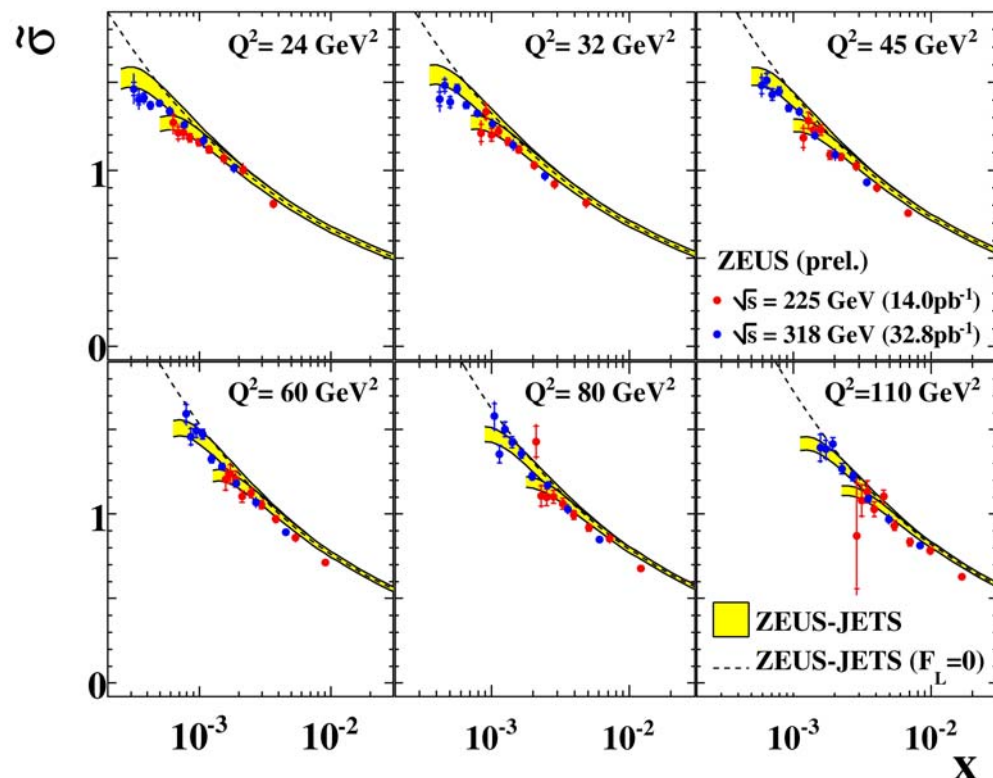
example: acceptance for open heavy flavor at LHC/HERA



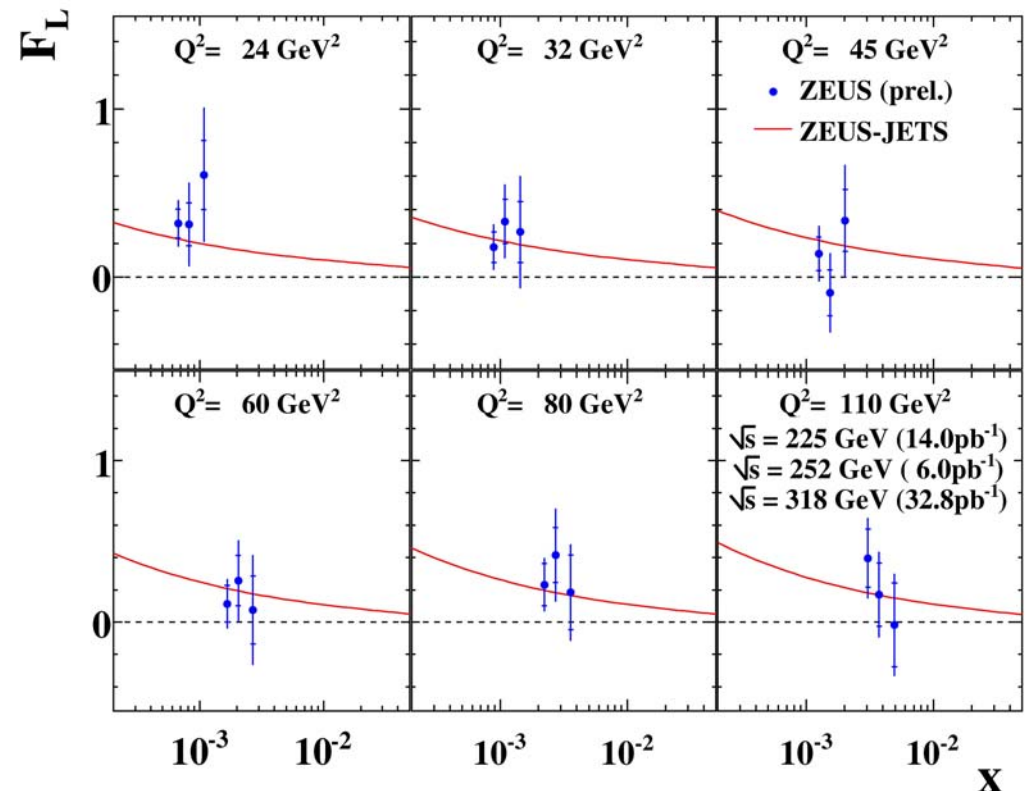
The longitudinal structure function F_L

data from all three energies (HER, LER, MER) being analysed,
working on additional/improved results at low Q^2 , low x , high y

ZEUS



ZEUS

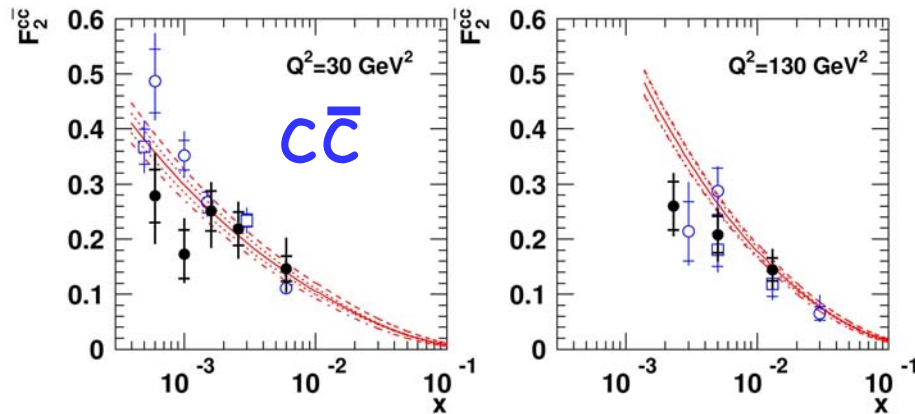


preliminary conclusion: successful consistency check
QCD works, gluon PDF is OK

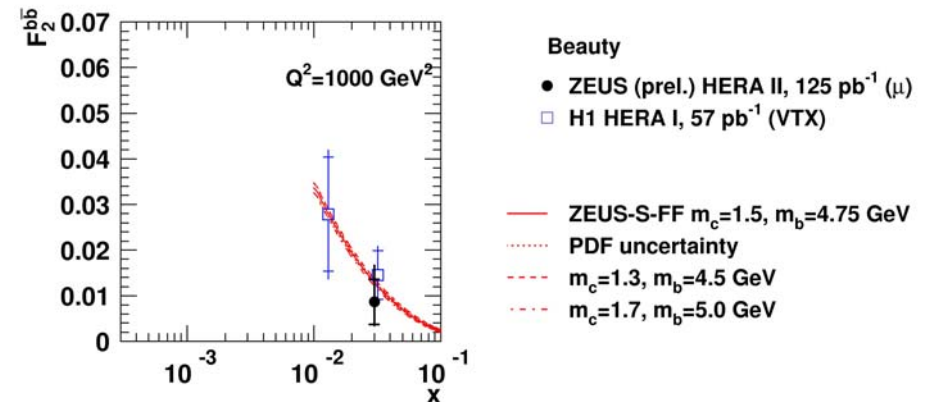
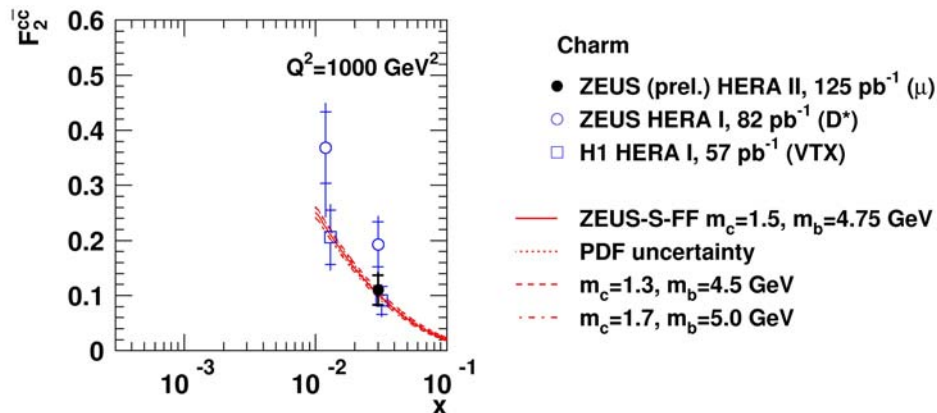
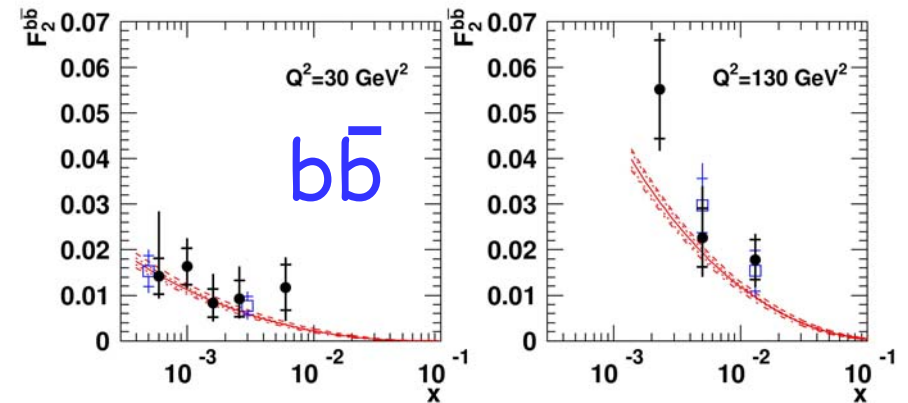
F2c and F2b from muon final state

from jet, muon, impact param., and p_T distributions

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analyses with full HERA II statistics yet to come

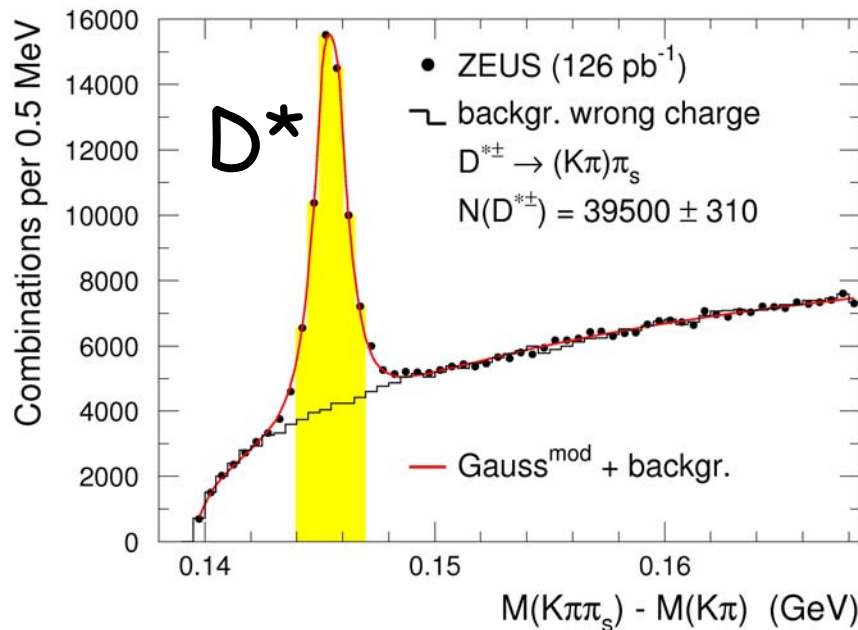
find best treatment of mass thresholds and multiple scales in theory

final goal: global PDF fits including jets and heavy flavours

Excited charm resonances

DESY-08-093

HERA is charm factory!



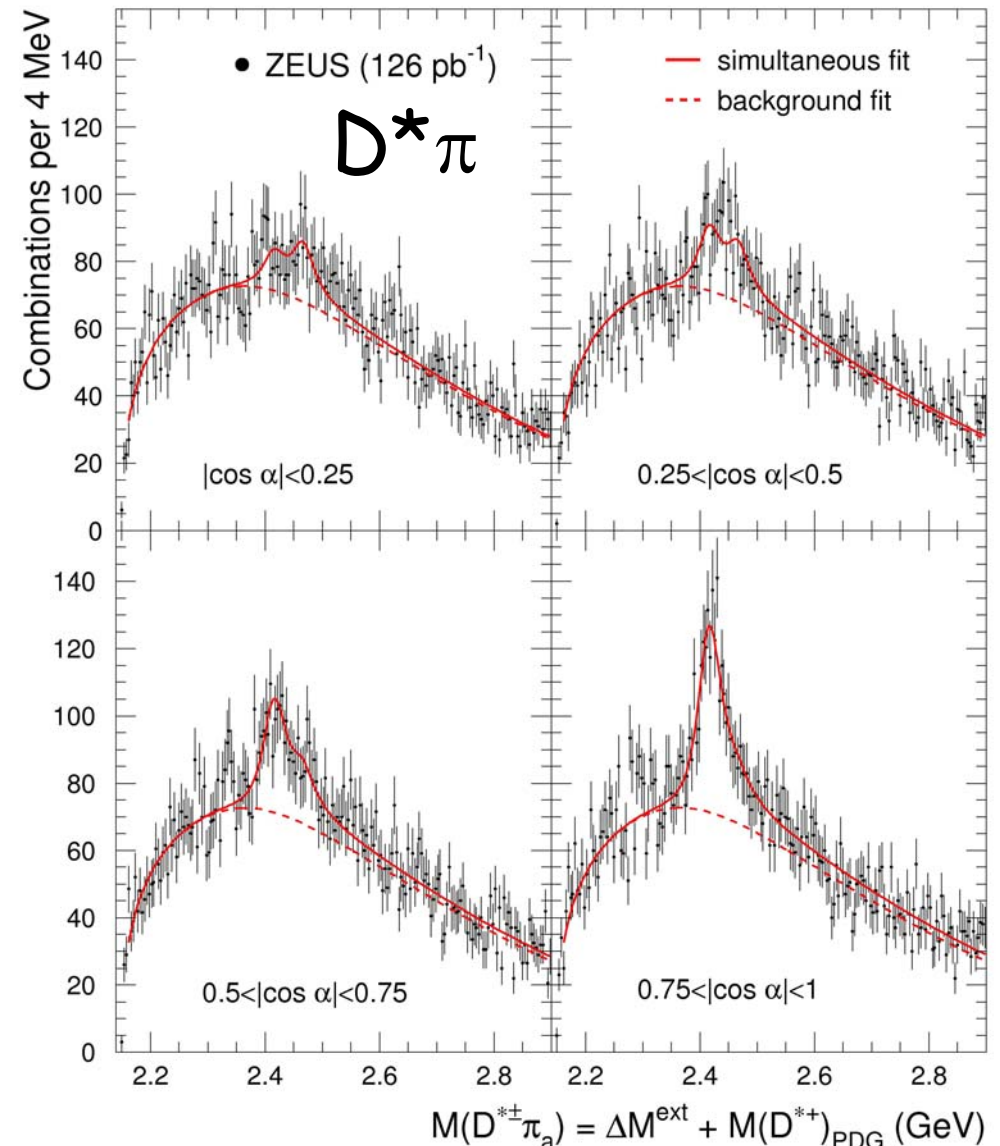
decay helicity:

$$h(D^0_1) = 5.9^{+3.0}_{-1.7} (\text{stat})^{+2.4}_{-1.0} (\text{syst})$$

-> compatible with D wave ($h=3$)

not compatible with S wave ($h=0$)

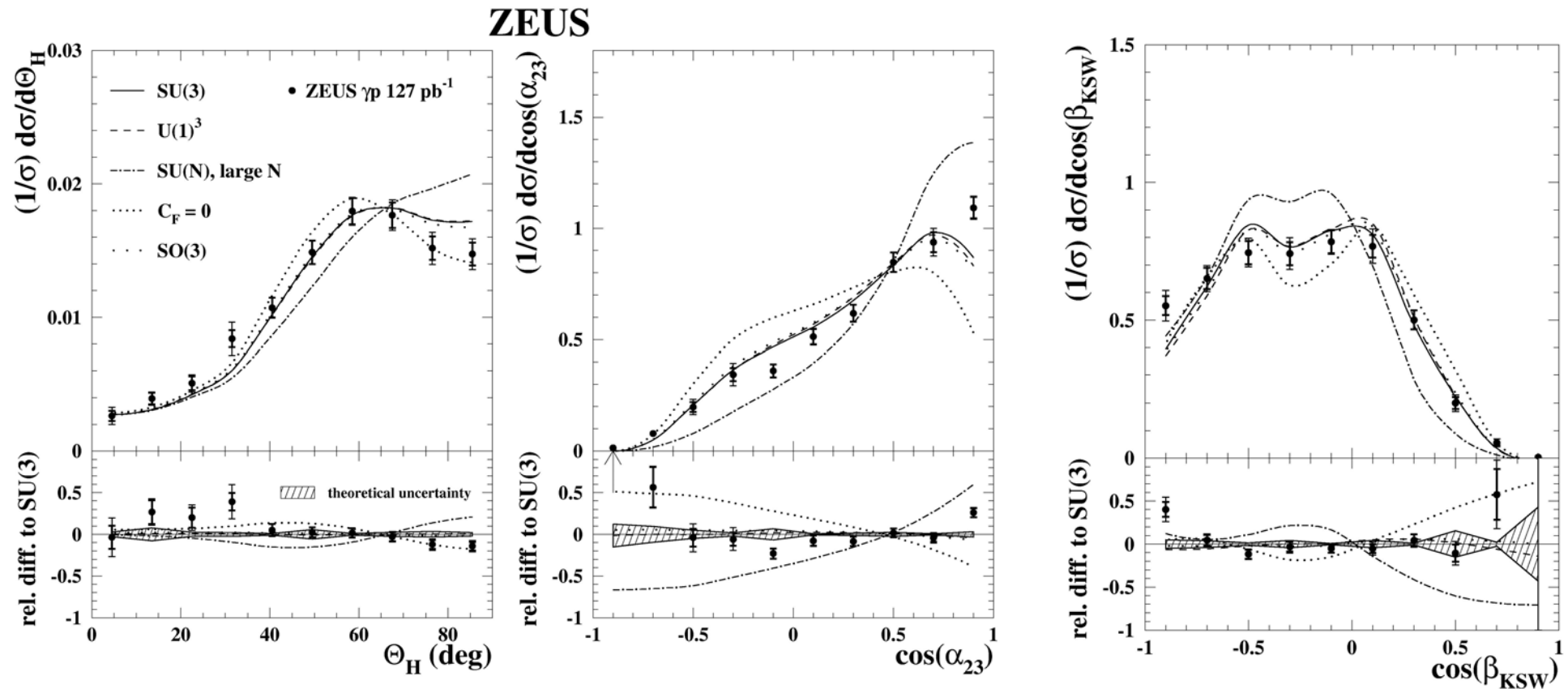
similarly for other excited D mesons



Trijet angular correlations

DESY-08-100

= measurement of QCD colour structure

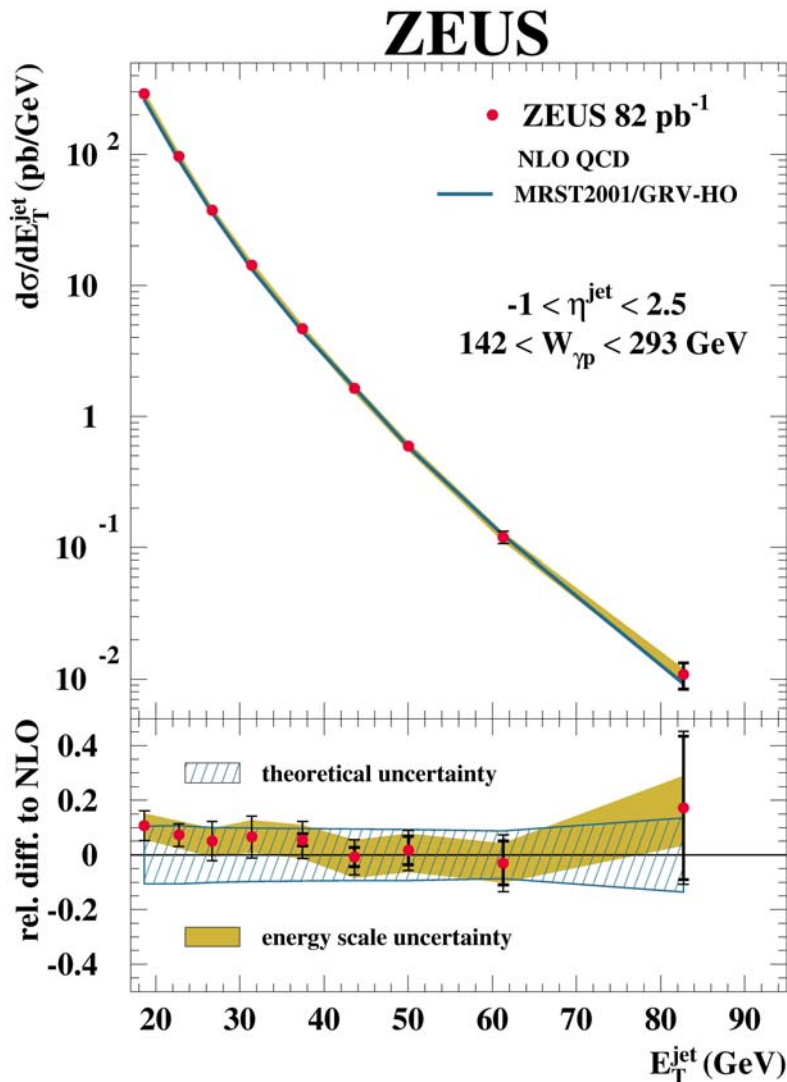


-> good agreement with $SU(3)$

$SU(N)$, $N \rightarrow \infty$ and $C_F = 0$ strongly disfavoured

α_s from inclusive jets in photoproduction

$\alpha_s(M_Z) = 0.1223 \pm 0.0001 \text{ (stat)} - 0.0021 + 0.0023 \text{ (exp)} \pm 0.0030 \text{ (th)}$
 latest measurement of a long series

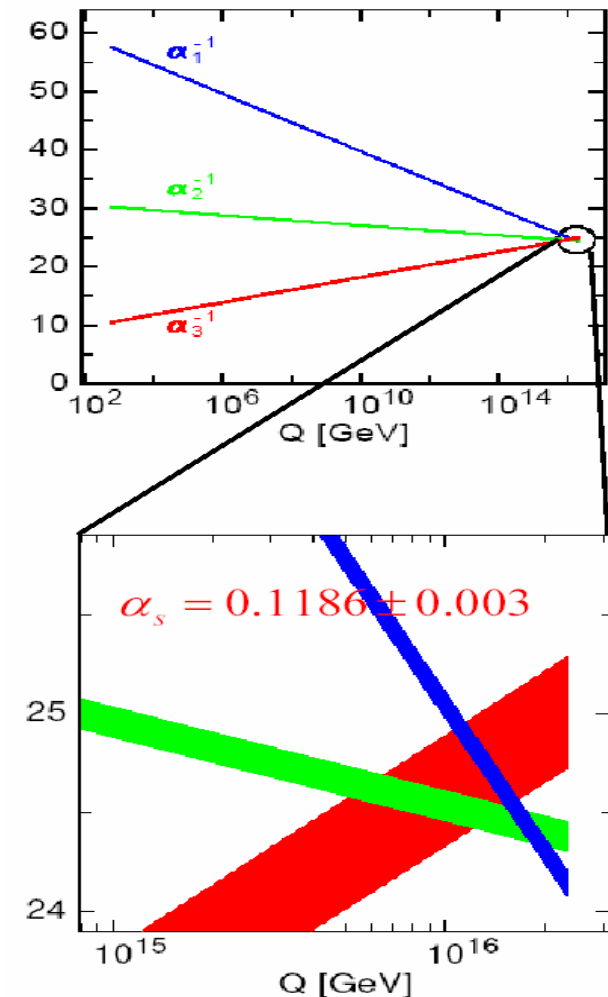


as usual,
 theoretical
 error
 dominates

=> need
 NNLO QCD !

=> most precise
 measurements
 (O(1-2%))

Outlook: GUT with SUSY



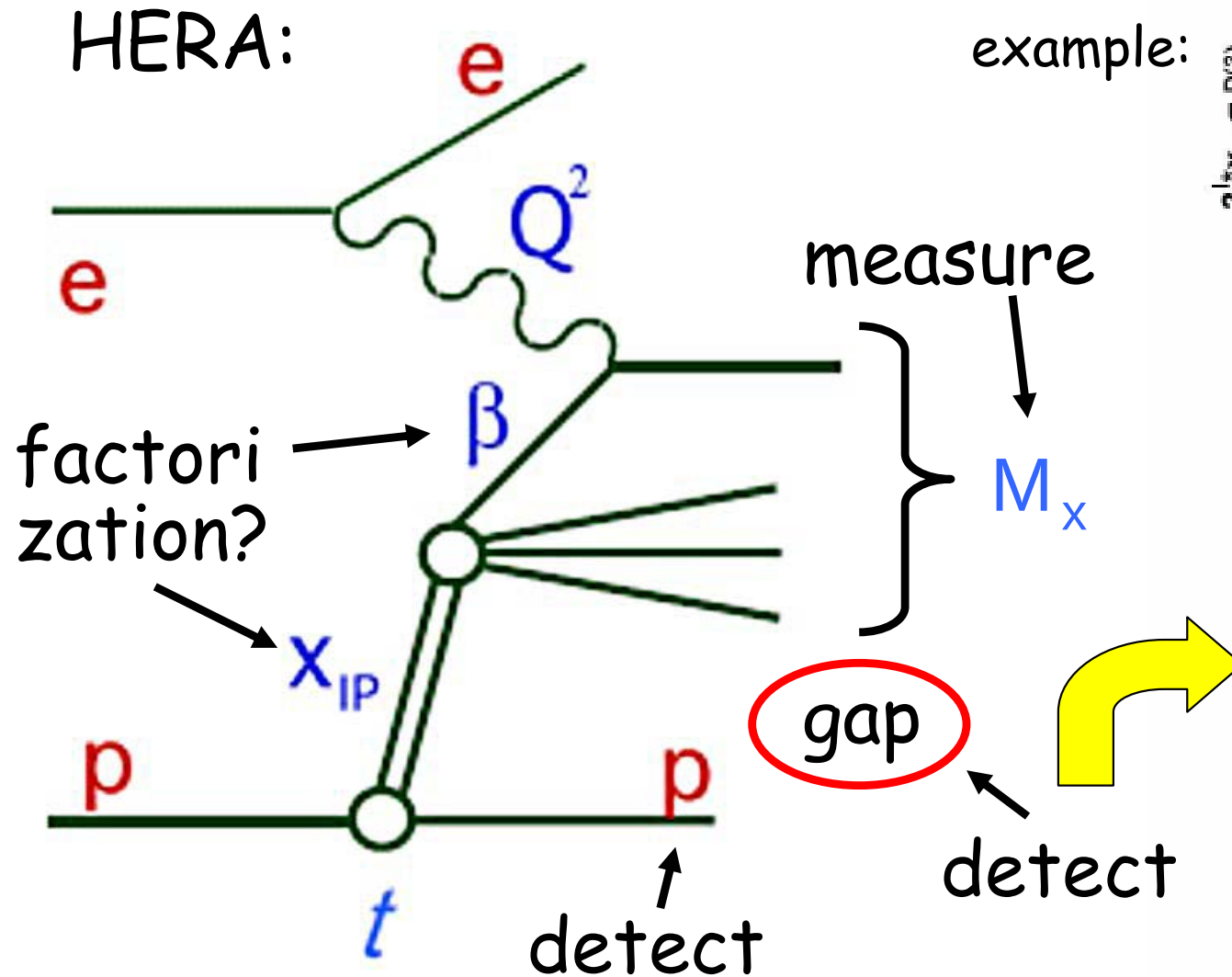
hep-ph/0407067 B.Allanach ... P.Zerwas

encouragement

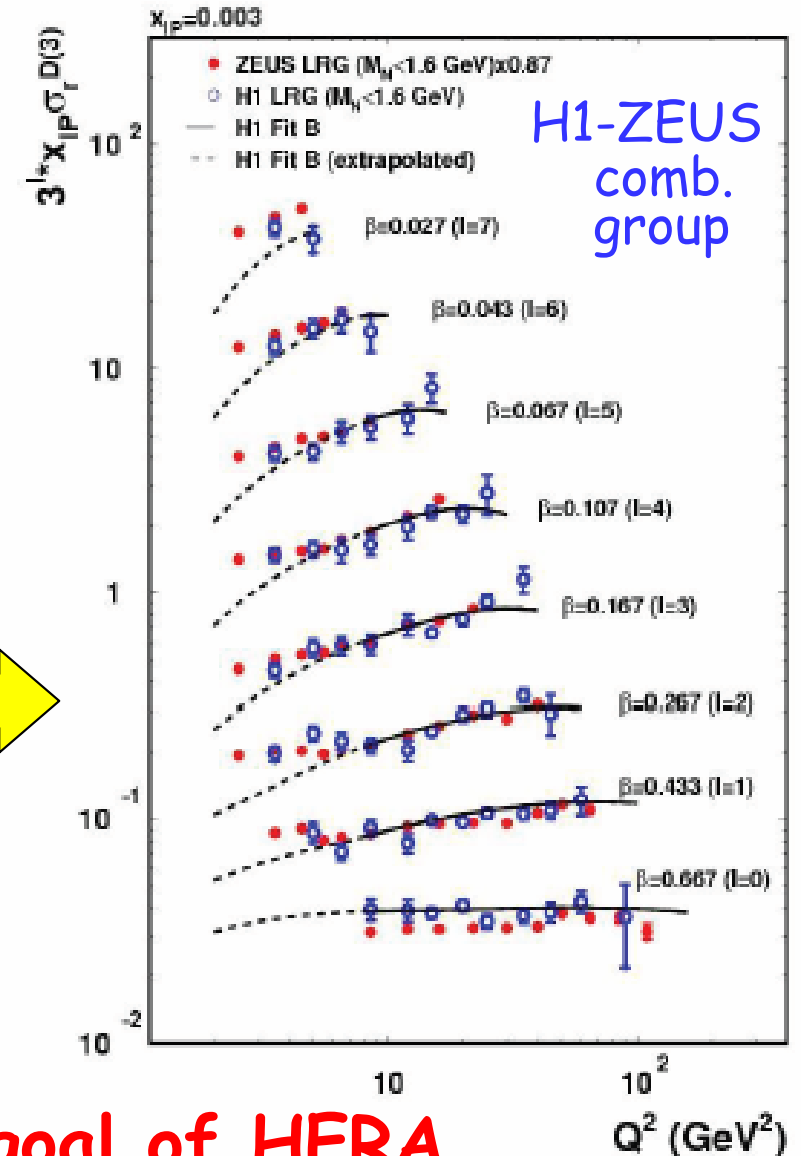
would like to express **strong encouragement** to the brave theory colleagues who are engaged in such difficult NNLO calculations for HERA

for recent progress, see e.g. HERA-LHC workshop

Diffractive structure functions



HERA inclusive diffraction



understanding diffraction = primary goal of HERA

ZEUS Dismantling status

- Dismantling almost finished without any major problems
- Last shipment of calorimeter modules Sept 5
- Iron yoke last component to be dismantled



Outlook until 2010

- Detector dismantling almost completed
- Tracking (Micro Vertex Detector) finalised, final calibrations and alignments being validated,
"Grand Reprocessing" of all HERA II data imminent
(finished latest mid-2009)
=> need large resources for MC (re-)processing (Grid!)
- Analysis tools being finalised
-> **"common ntuples" (root)**
-> to be used by all ZEUS analyses by/after 2010
- **Currently ~75 analyses listed**, of which 17 already in EB process.
25 suffering from (wo)manpower shortage.
- **"priority analyses" based on reprocessed data (~30)**
scheduled to be completed by 2010
- **Increasing efforts towards combined final H1/ZEUS results**

Outlook until 2014

- ZEUS/HERA data are **unique**
- finalise **combined H1/ZEUS results**
- **THE** reference for proton structure functions
- archival of data in easily maintainable format
currently foreseen for ZEUS: root ntuples on dcache
- **Potential reanalysis based on findings at LHC**
("expected" new physics, surprises, ...)
- **Potential reanalysis based on progress in theory**
(e.g. NNLO analysis of α_s in view of SUSY grand unification)
- after 2009: no work any more on calibrations, tool development, processing, ... => **results can be obtained with much reduced (wo)manpower**