New Results from ZEUS

Aharon Levy
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Aharon Levy
Tel Aviv University and DESY

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302	Jets in NC DIS with kt, anti-kt and SISCone ← α_s
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305	Dijets in PHP and constraints on p and gamma PDFs
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687	HERAPDF 1.5 ← jets
690	HERAPDF 1.0 ← low energy

EPS 2011

40 abstracts (27 ZEUS only)
10 talks
6 posters

R.J. Cashmore et al., Phys. Rep. 22, 275 (1985)

HERA is a machine designed to study lepton quark collisions at very high energies and high Q^2, hence probing very small distance scales. In table 1.1 HERA is compared [1.3] with other accelerators and conceived accelerators of the next 10–15 years.

The constituent centre-of-mass energies are comparable (except for the LHC and SSC) but HERA is unique in that one of the participating particles in the interaction is observed in the final state. This makes HERA a precision instrument in the study of quarks and their interactions.

This precision instrument can be used to continue the study of neutral current and charged current reactions to $Q^2 \sim 100$ times those achievable today with fixed target experiments. Approximate event rates for these processes are shown in fig. 1.2. Structure functions can be measured and QCD tested at Q^2 of ~10 000–20 000 GeV^2 while there will be sources of well-identified light quarks in, for example, $e^- u \to \nu d$ reactions. This already represents an exciting and obvious programme of physics which will complement the more exploratory studies that can and will be made. The open questions of particle physics today are all approached at HERA. The existence of a larger electroweak [1.4] group encompassing $SU(2)_L \times U(1)$ [1.5] would lead to new currents and particles while technicolour models [1.6] (alternatives to the Higgs process) indicate the existence of leptoquarks. All of these phenomena are accessible to studies at HERA. The mass hierarchy problem has "explanations" in terms of substructure [1.7] or supersymmetry [1.8] again leading to phenomena potentially observable at HERA. Indeed there is a general prejudice that some new phenomena must occur on the mass scale of ~200–300 GeV which can be reached at HERA. It is these latter possibilities which we have dealt with in the remaining parts of this paper.

EXOTICS

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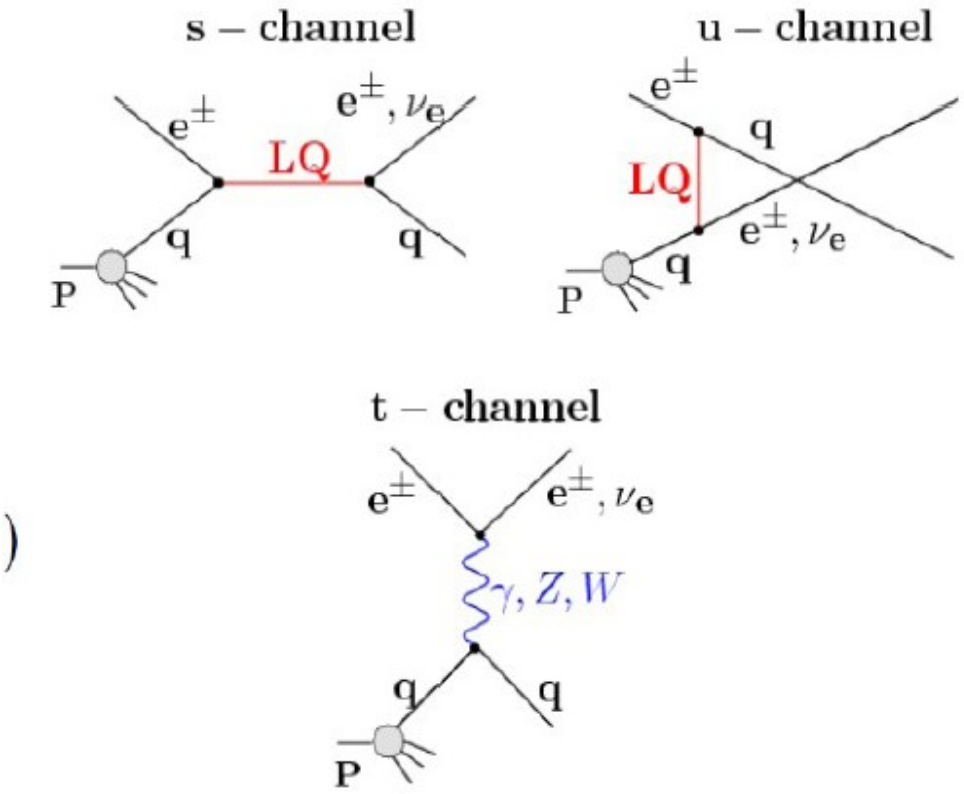
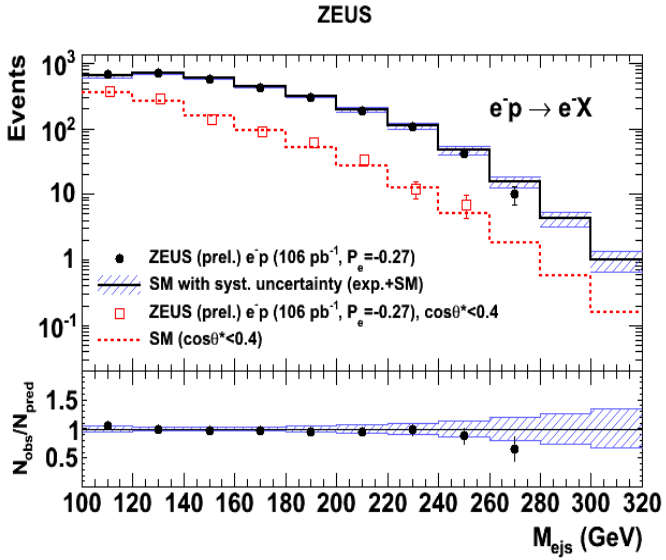
Leptoquarks

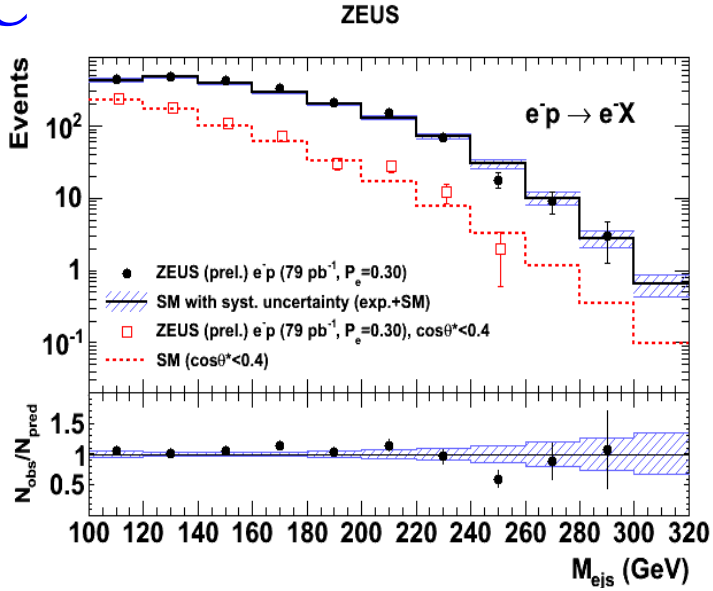


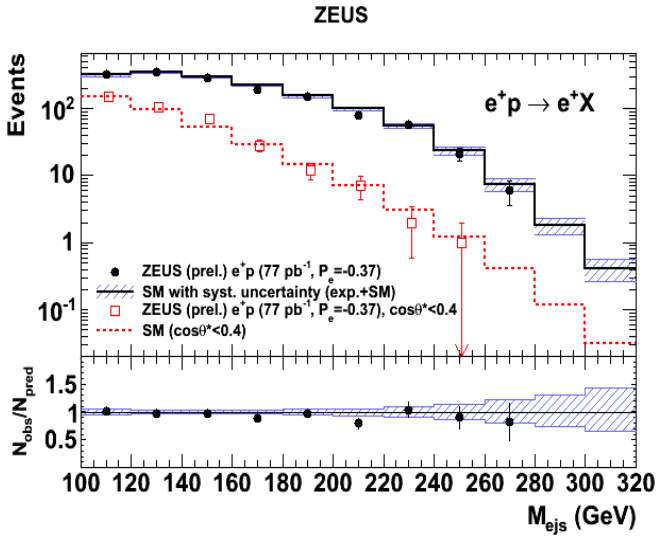
)

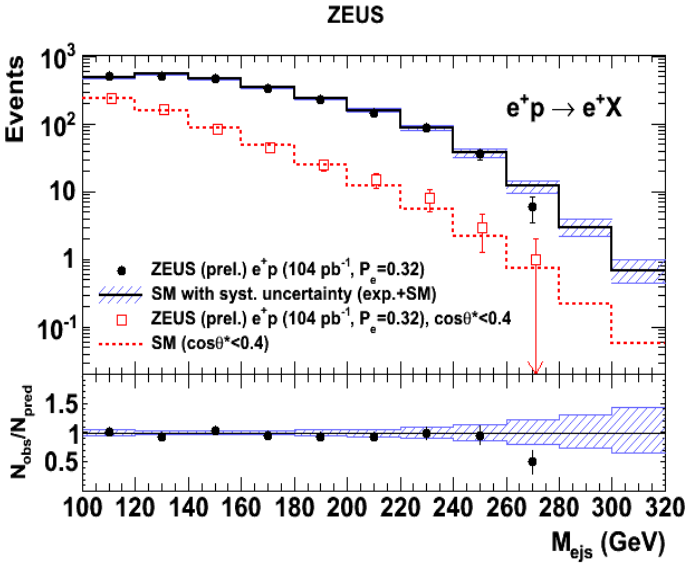
Leptoquarks

NC



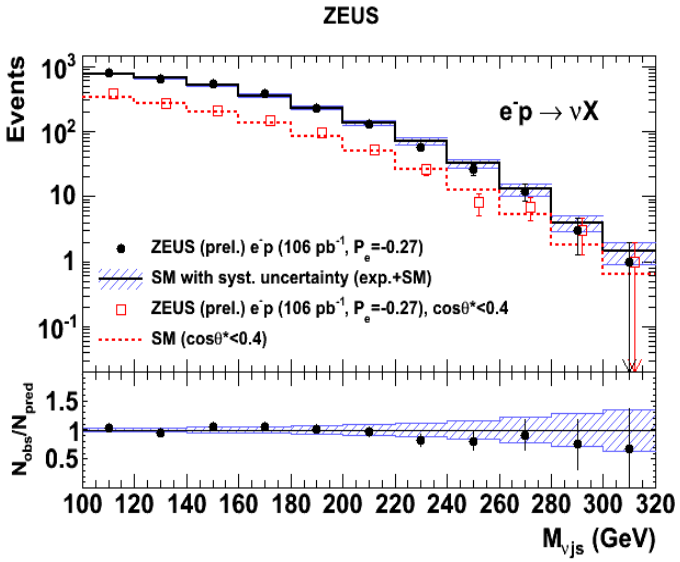


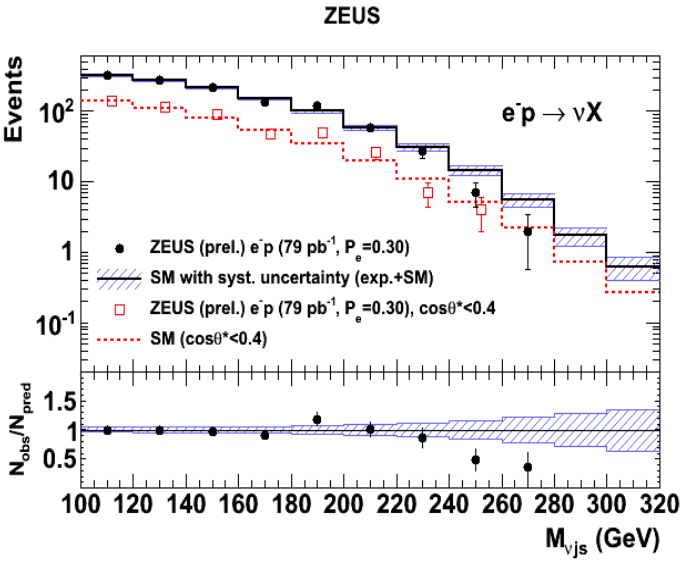


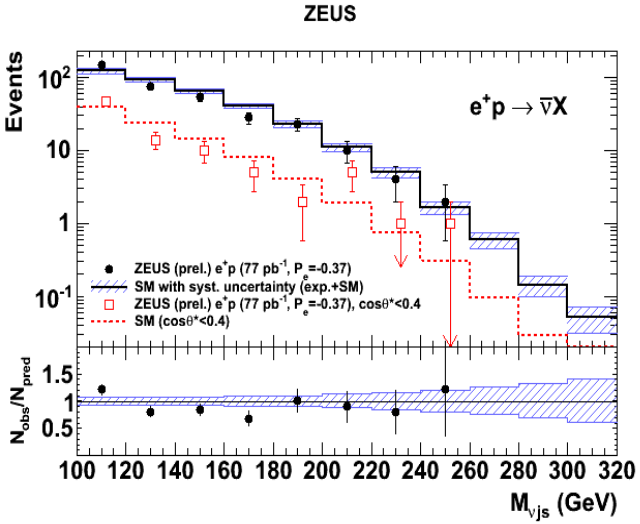


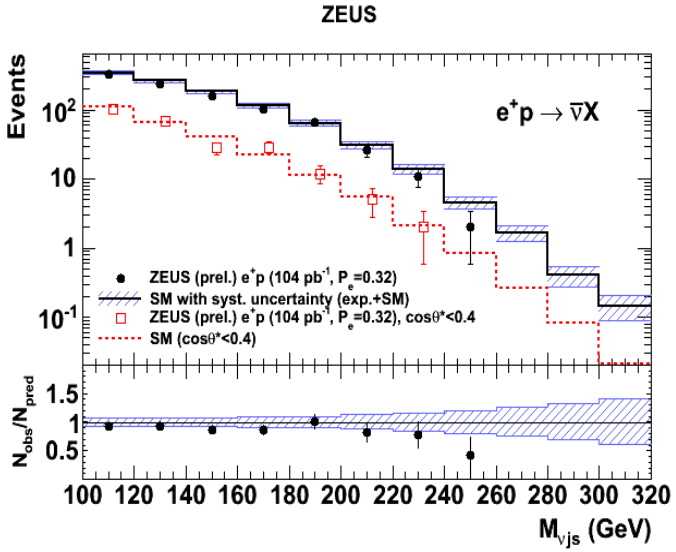
Leptoquarks

CC

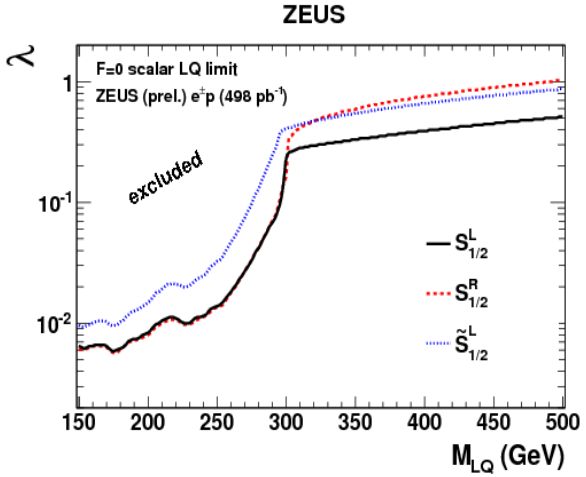


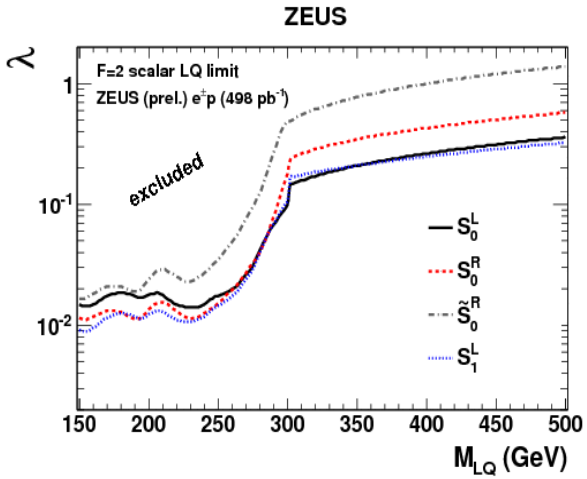


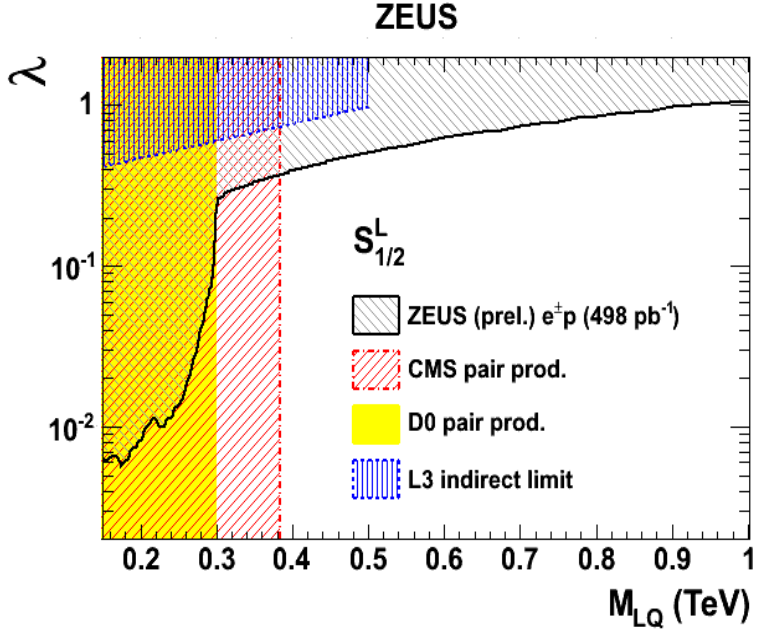


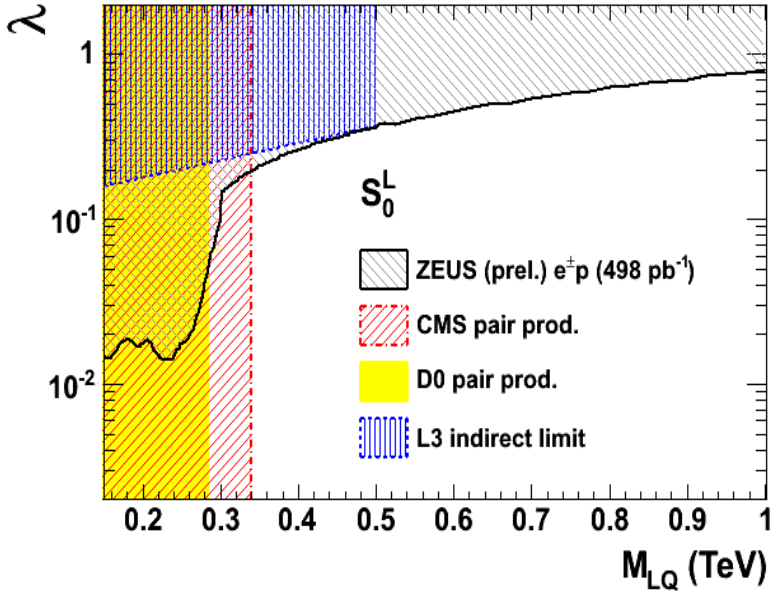


Leptoquarks







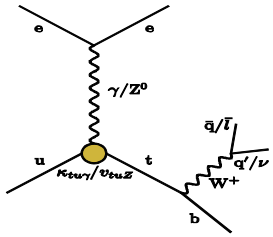


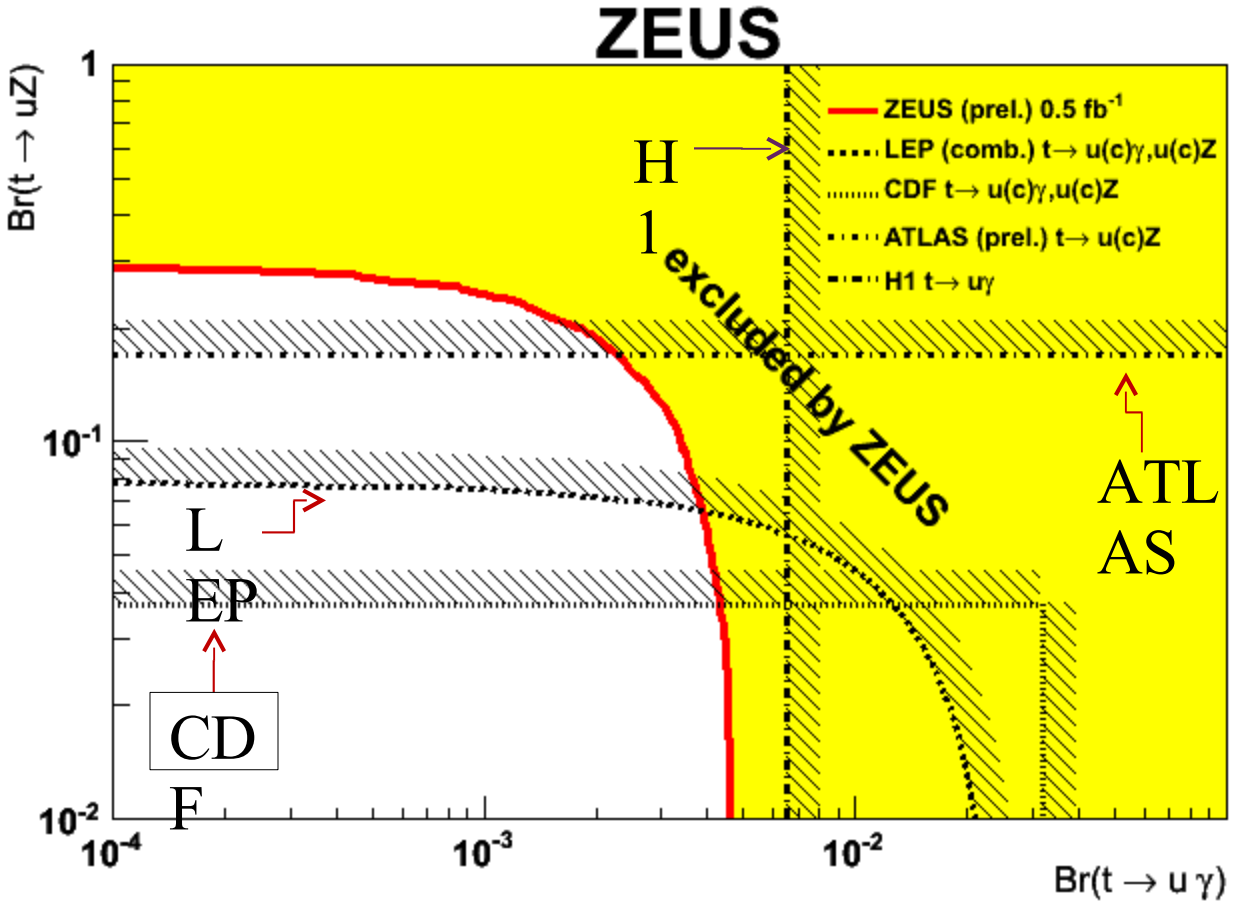
for $\lambda = 0.3$

LQ Type (F=0)	V_0^L	V_0^R	$\tilde{V}_0^R$	V_1^L	$S_{1/2}^L$	$S_{1/2}^R$	$\tilde{S}_{1/2}^L$
M_{LQ}(GeV) ZEUS (prel.)	504	293	343	629	322	300	293
LQ Type (F=2)	S_0^L	S_0^R	$\tilde{S}_0^R$	S_1^L	$V_{1/2}^L$	$V_{1/2}^R$	$\tilde{V}_{1/2}^L$
M_{LQ}(GeV) ZEUS (prel.)	435	326	291	466	292	324	409

ZEUS-prel-11-008

Single top production





ZEUS-prel-11-009

What are we still doing here?

4 years, 4 days 16 hours and 45 minutes ago HERA stopped taking data.
What are we still doing here?
Presenting new results?
Having still many excited young people (including about 50 students) analysing HERA data?!

Looked for new phenomena; found steep rise of structure function at low x; discovered diffraction in DIS – large rapidity gap events. Almost found leptoquarks…
Physics is not just about finding big discoveries. We want to understand QCD and ultimately understand the structure of the proton.
Need to get to highest possible precision measurements and finish to analyse all HERA data.
Need to preserve HERA data for future use.

QCD - α_S

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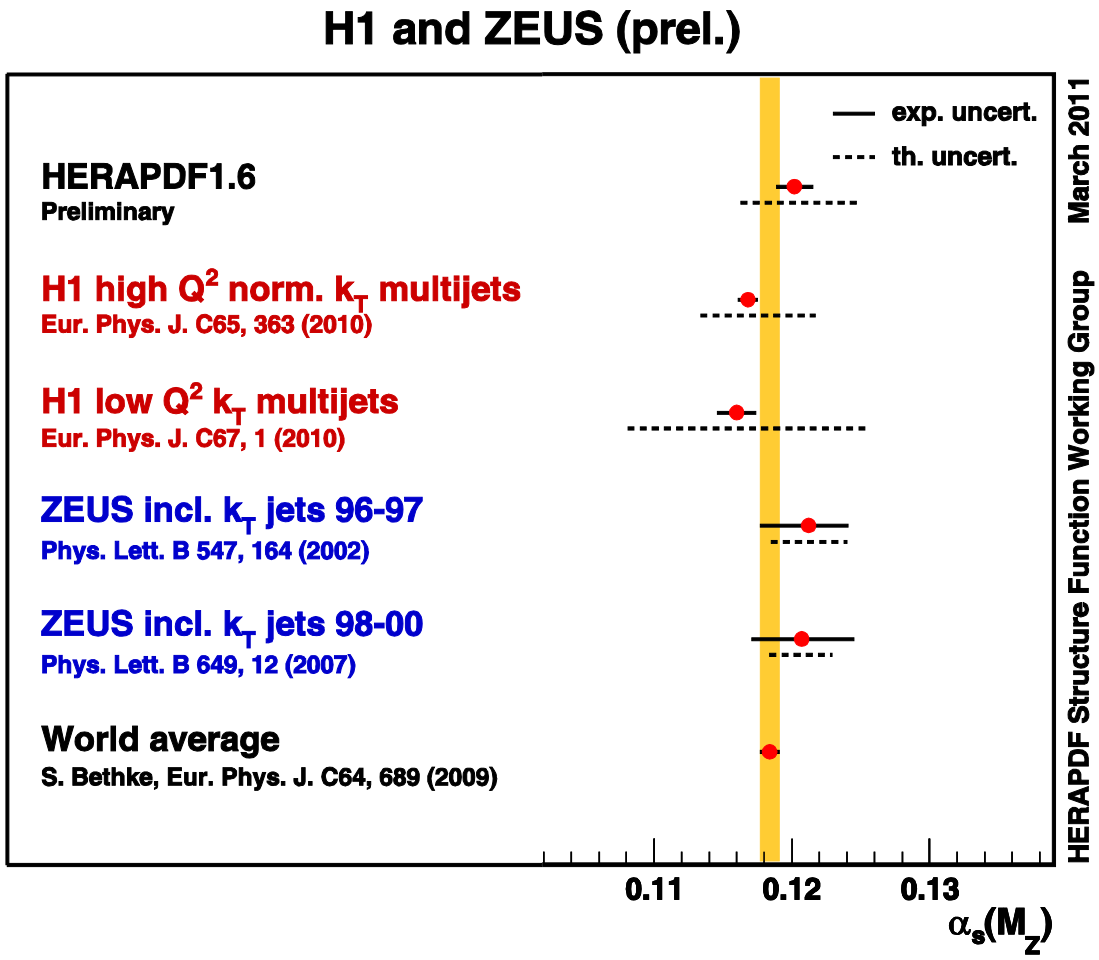
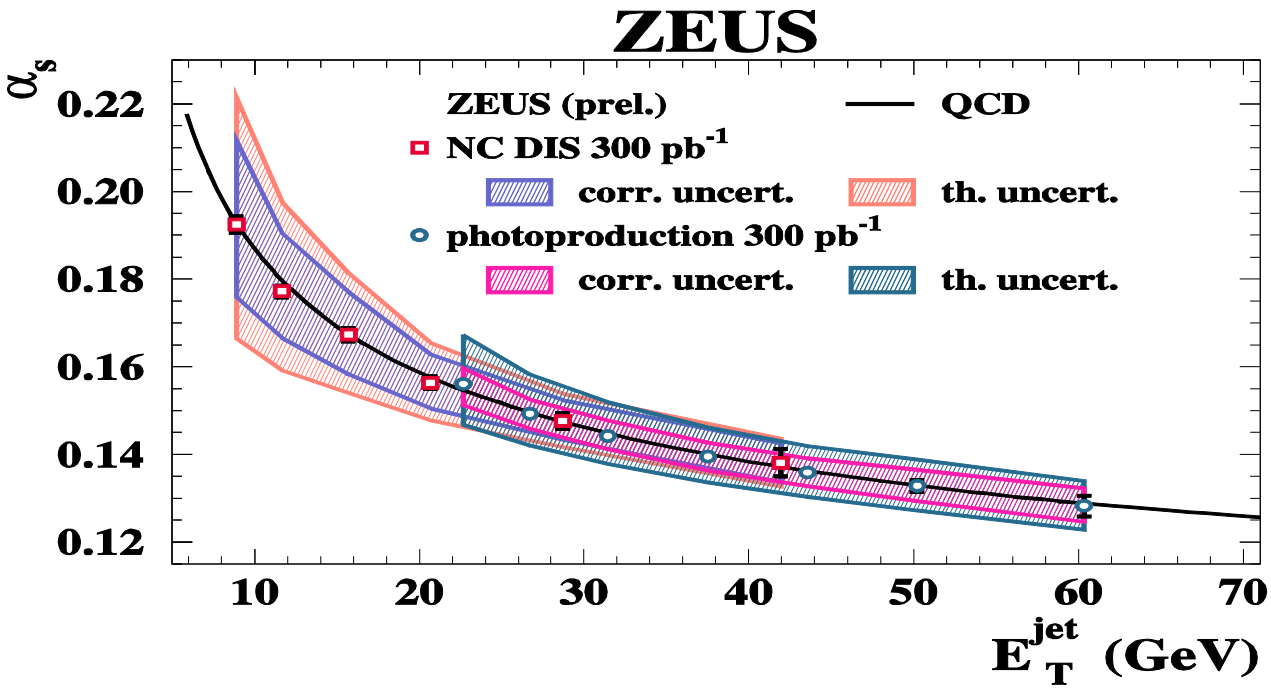
use F2 + jets as input, get □S and pdfs simultaneously

use pdfs as input, get □S from jets

Significant reduction of the correlation between the gluon pdf and □S.
Improve precision of the gluon pdf.
Unbiased determination of □S.



H1-prel-11-034, ZEUS-prel-001



ZEUS-prel-11-005

nice observation of the running of S within one experiment and one process.

arXiv:1107.0338
Title: Setting the Renormalization Scale in QCD: The Principle of Maximum Conformality
Authors: Stanley J. Brodsky and Leonardo Di Giustino

QCD – Heavy Flavor

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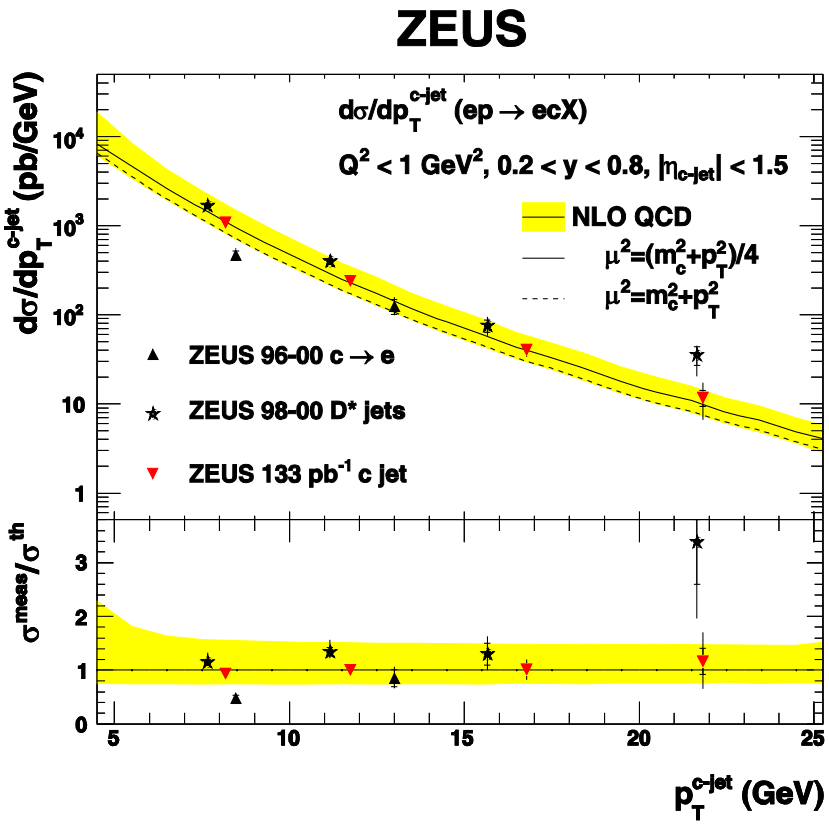
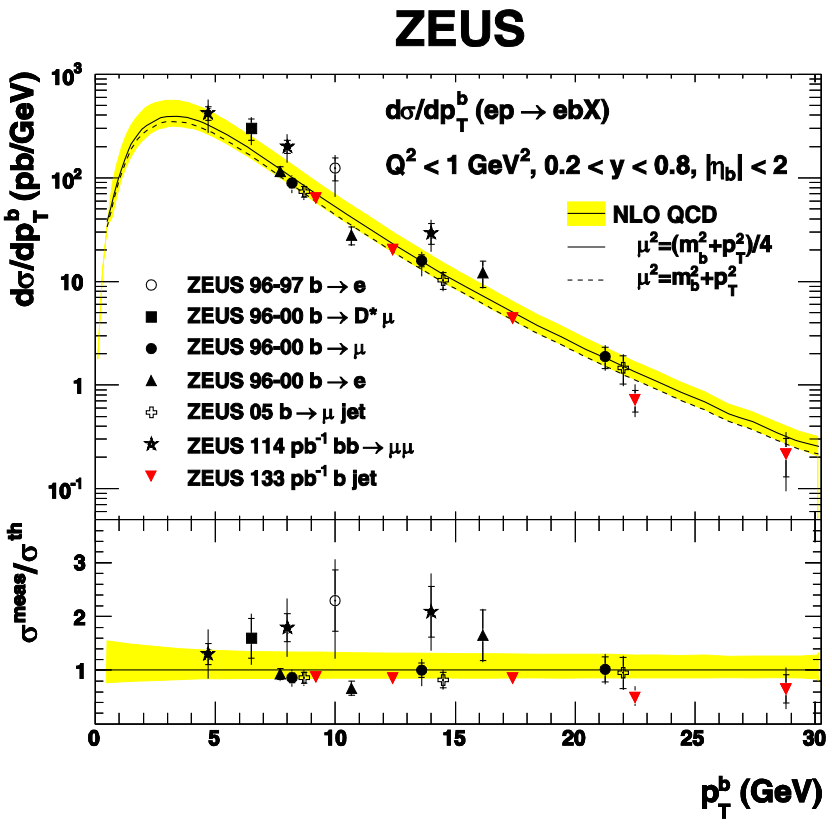
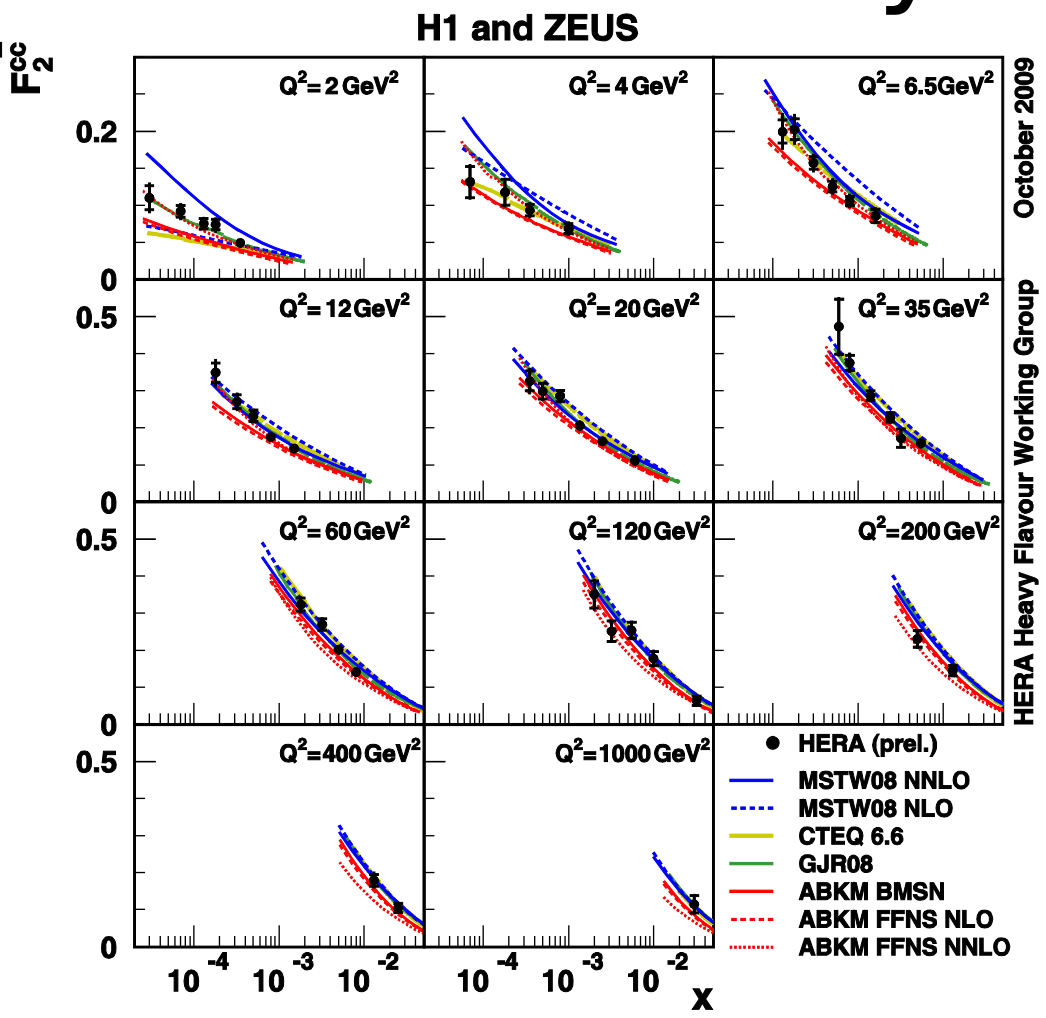




Eur. Phys. J. C71, 1659 (2011)

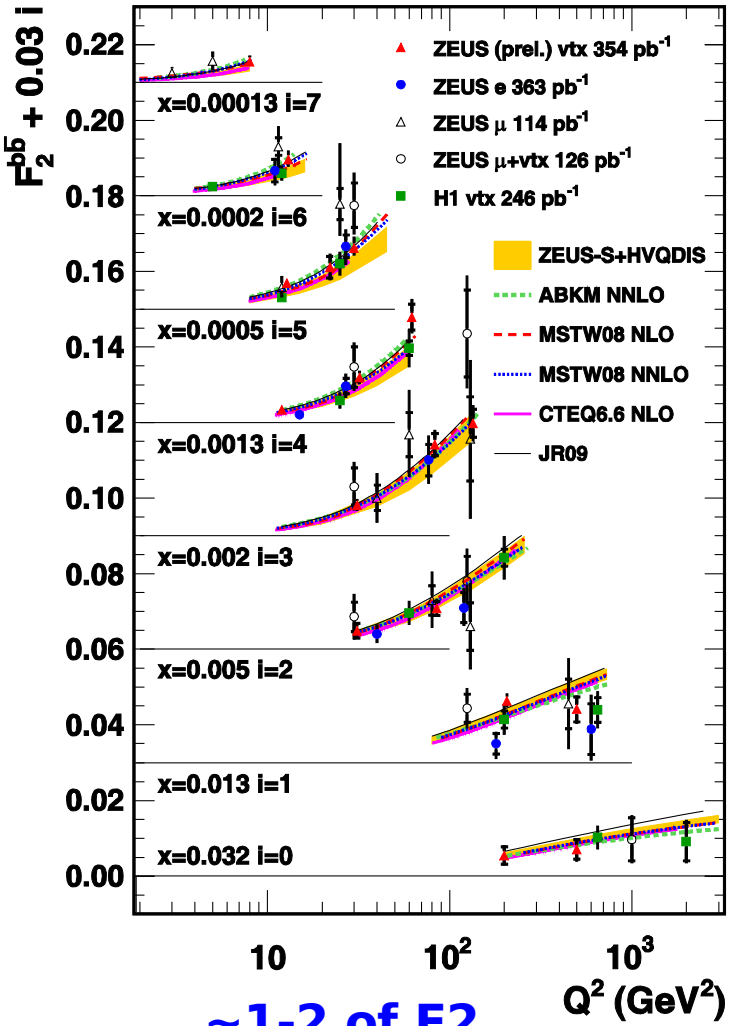
Lesson: the massive scheme works up to the highest pT measured.

Heavy Flavor



~30 of F2

HERA



~1-2 of F2

QCD - mC

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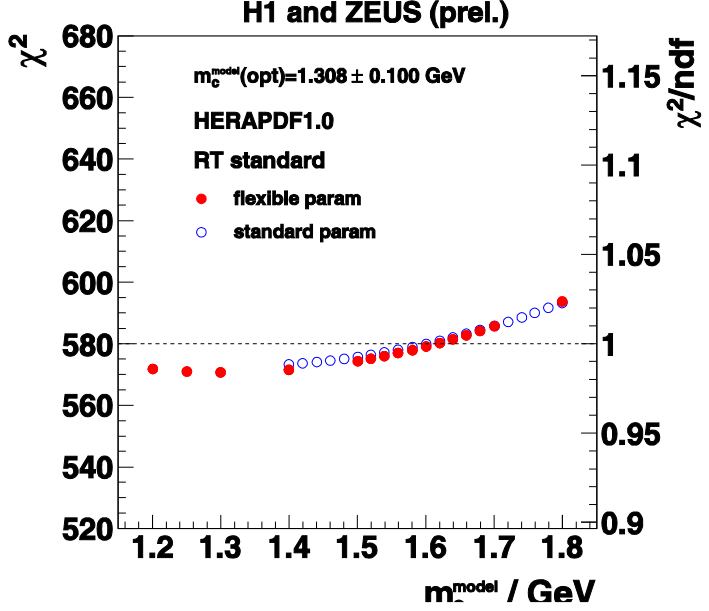
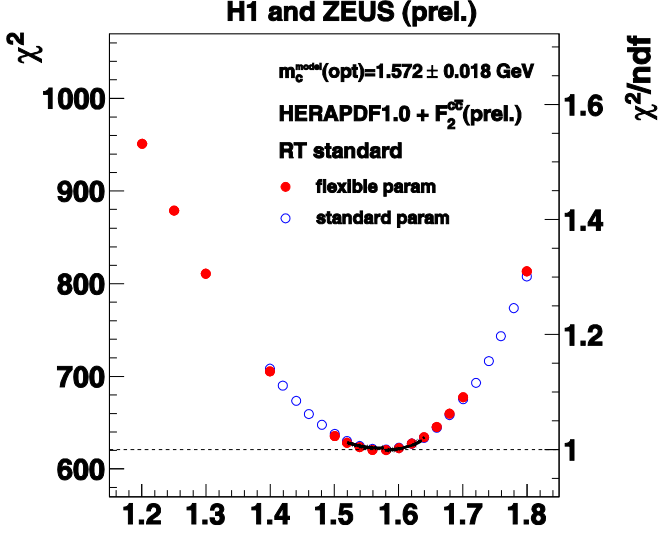
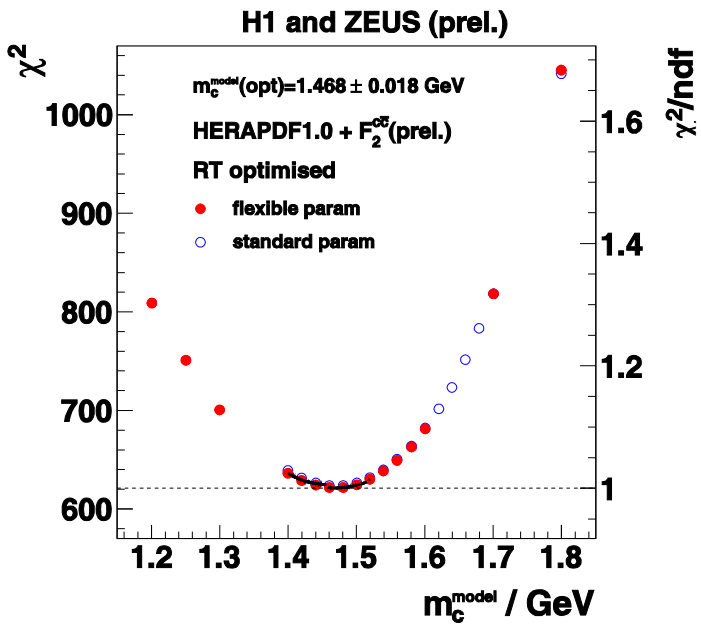
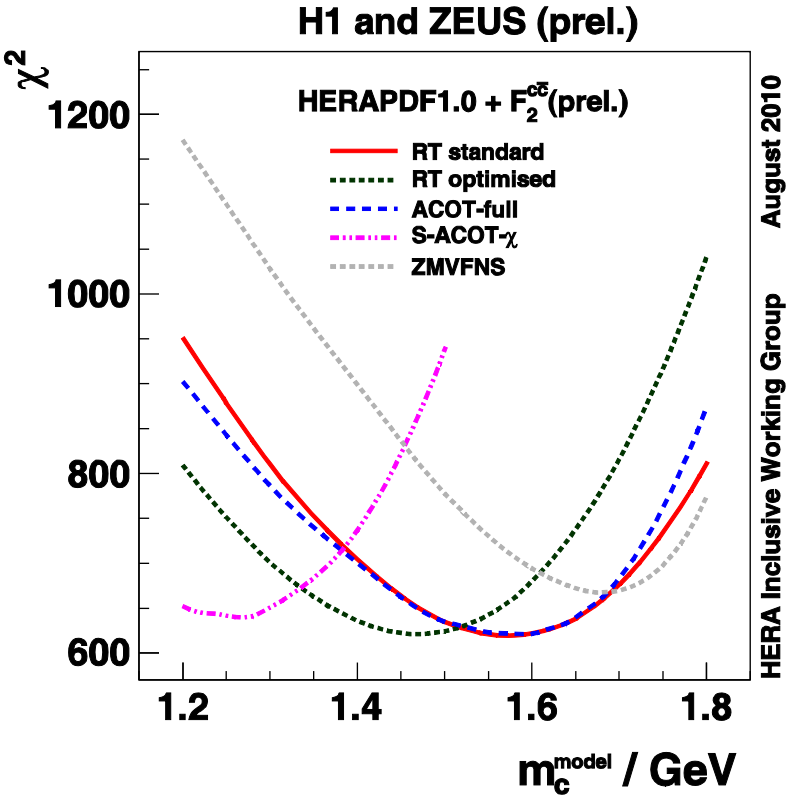
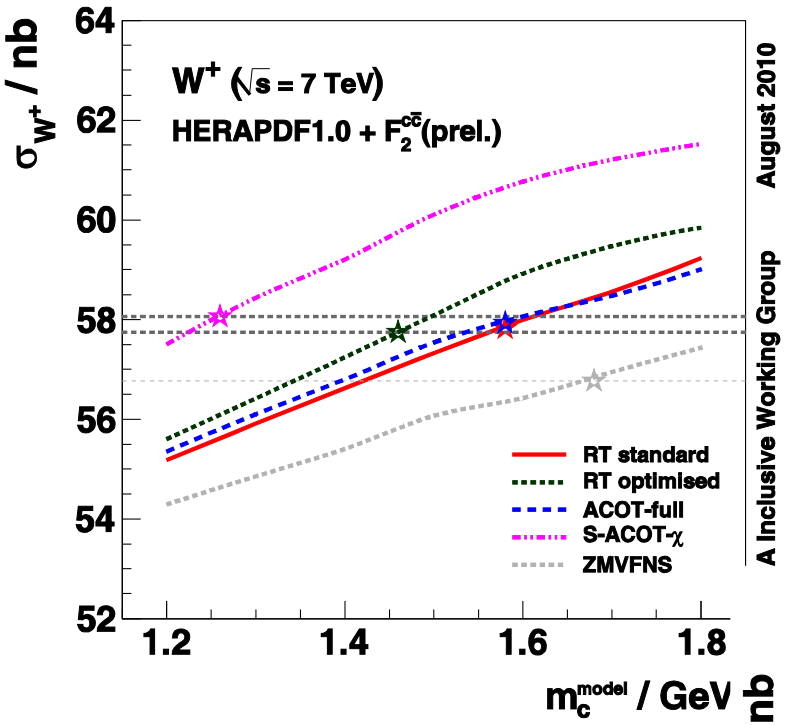
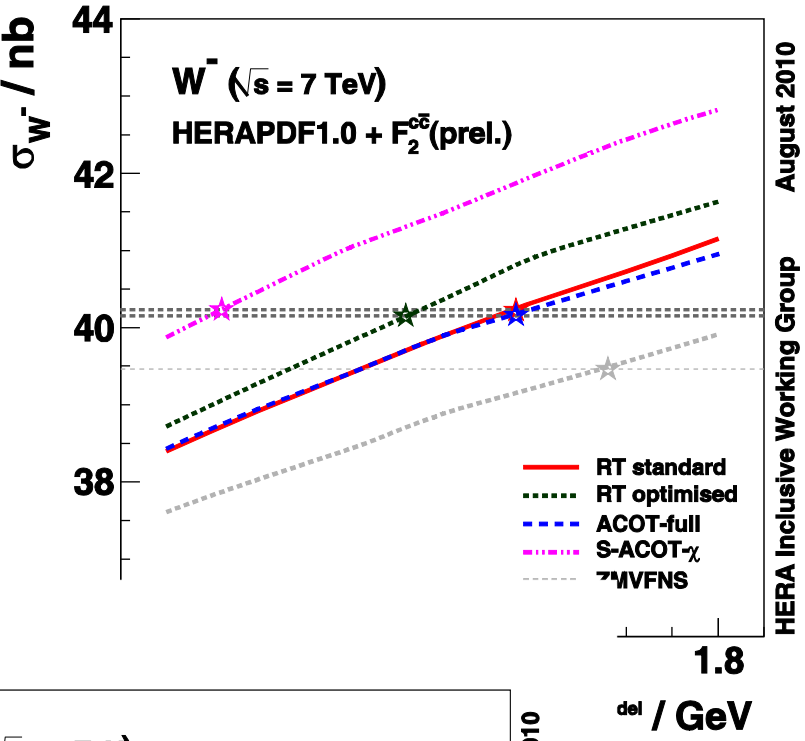

H1 and ZEUS (prel.)
m_c^{model}(opt)=1.308 ± 0.100 GeV
HERAPDF1.0
RT standard
flexible param
standard param
χ^2
χ^2/ndf
m_c^{model} / GeV

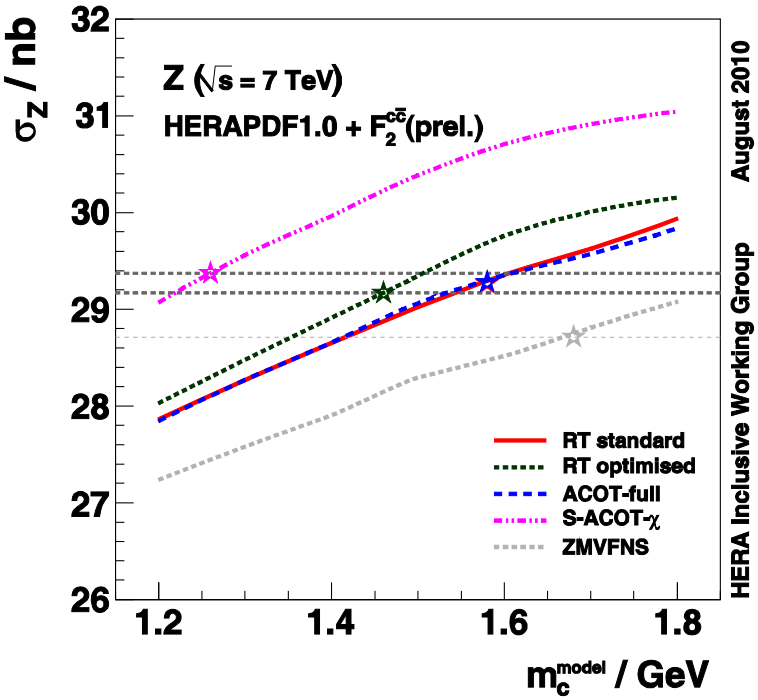

H1 and ZEUS (prel.)
m_c^{model}(opt)=1.572 ± 0.018 GeV
HERAPDF1.0 + $F_2^{c\bar{c}}$(prel.)
RT standard
flexible param
standard param
χ^2
χ^2/ndf


H1 and ZEUS (prel.)
m_c^{model}(opt)=1.468 ± 0.018 GeV
HERAPDF1.0 + $F_2^{c\bar{c}}$(prel.)
RT optimised
flexible param
standard param
χ^2
χ^2/ndf
m_c^{model} / GeV


H1 and ZEUS (prel.)
HERAPDF1.0 + $F_2^{c\bar{c}}$(prel.)
RT standard
RT optimised
ACOT-full
S-ACOT-χ
ZMVFNS
August 2010
HERA Inclusive Working Group
χ^2
m_c^{model} / GeV







From charm mass scan fix mC
Fixing mC u and d better determined
** W and Z cross-section predictions more precise**

proton structure

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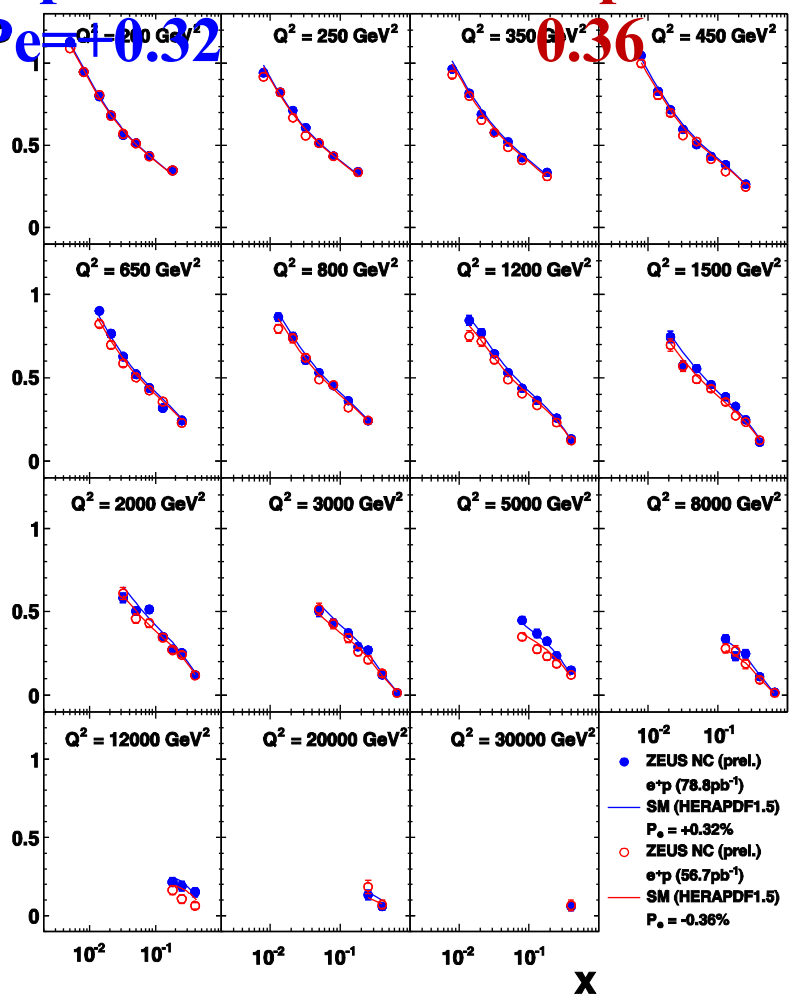
Cross sections and F2, xF3

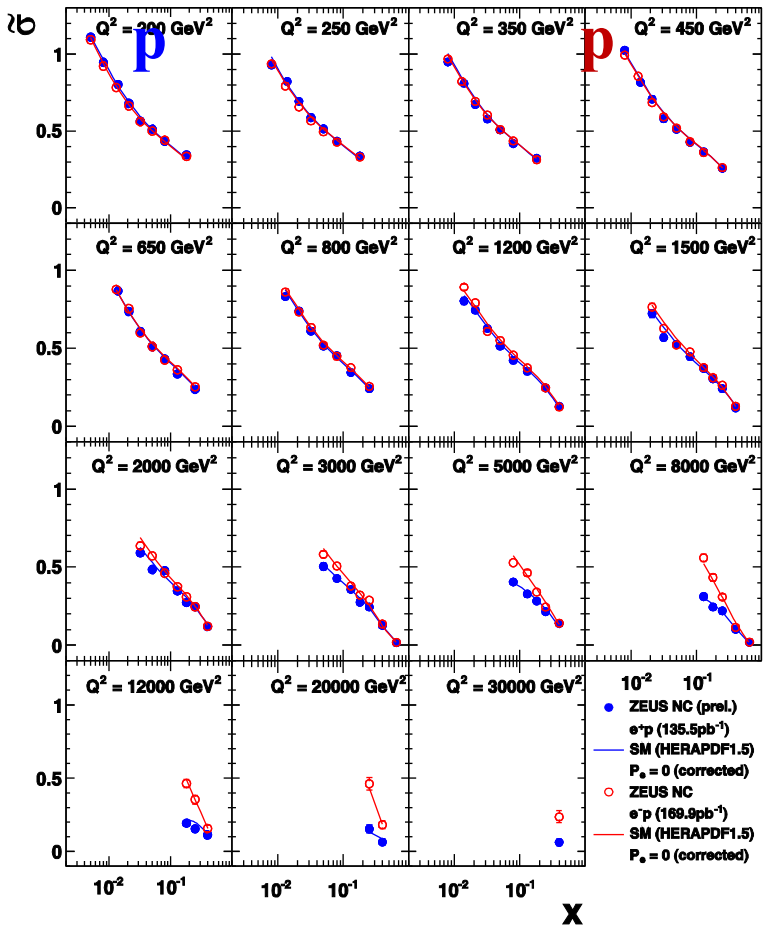
Completed the ZEUS HERAII inclusive

e+p Pe=+0.32



e+p Pe=-0.36

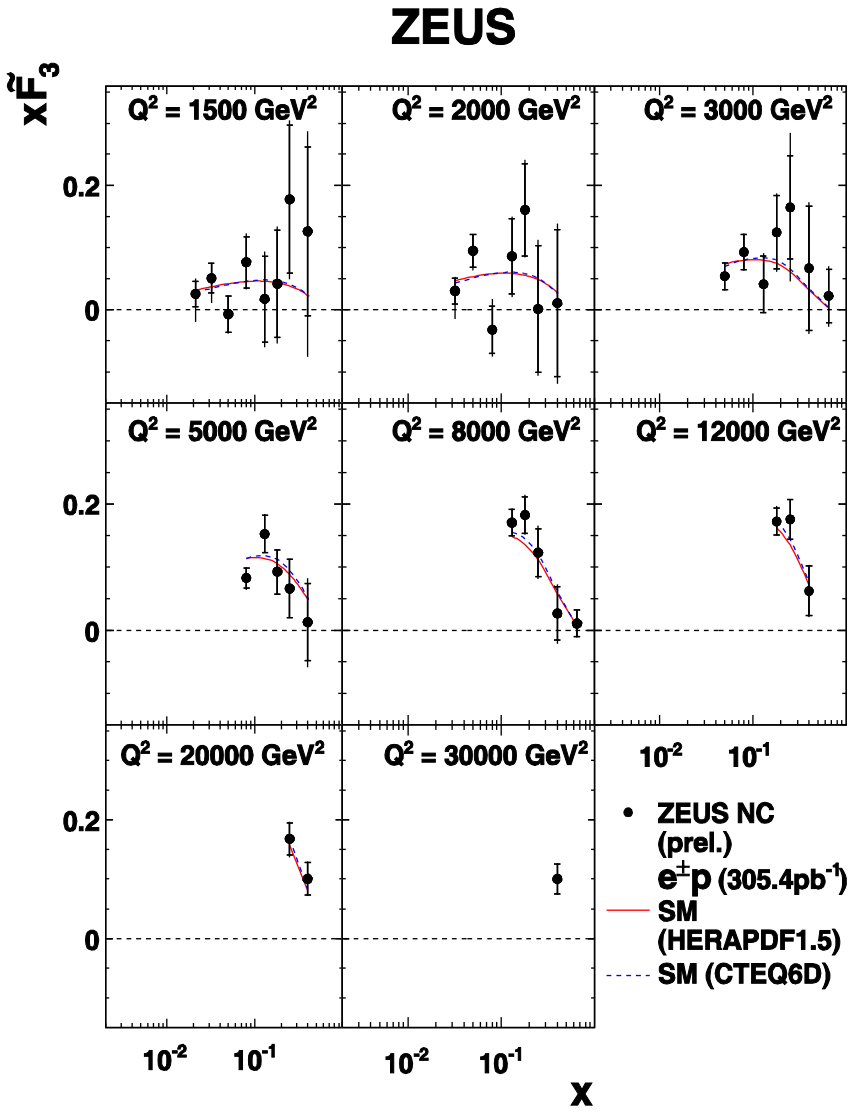
e+ p



e- p

ZEUS-prel-11-003

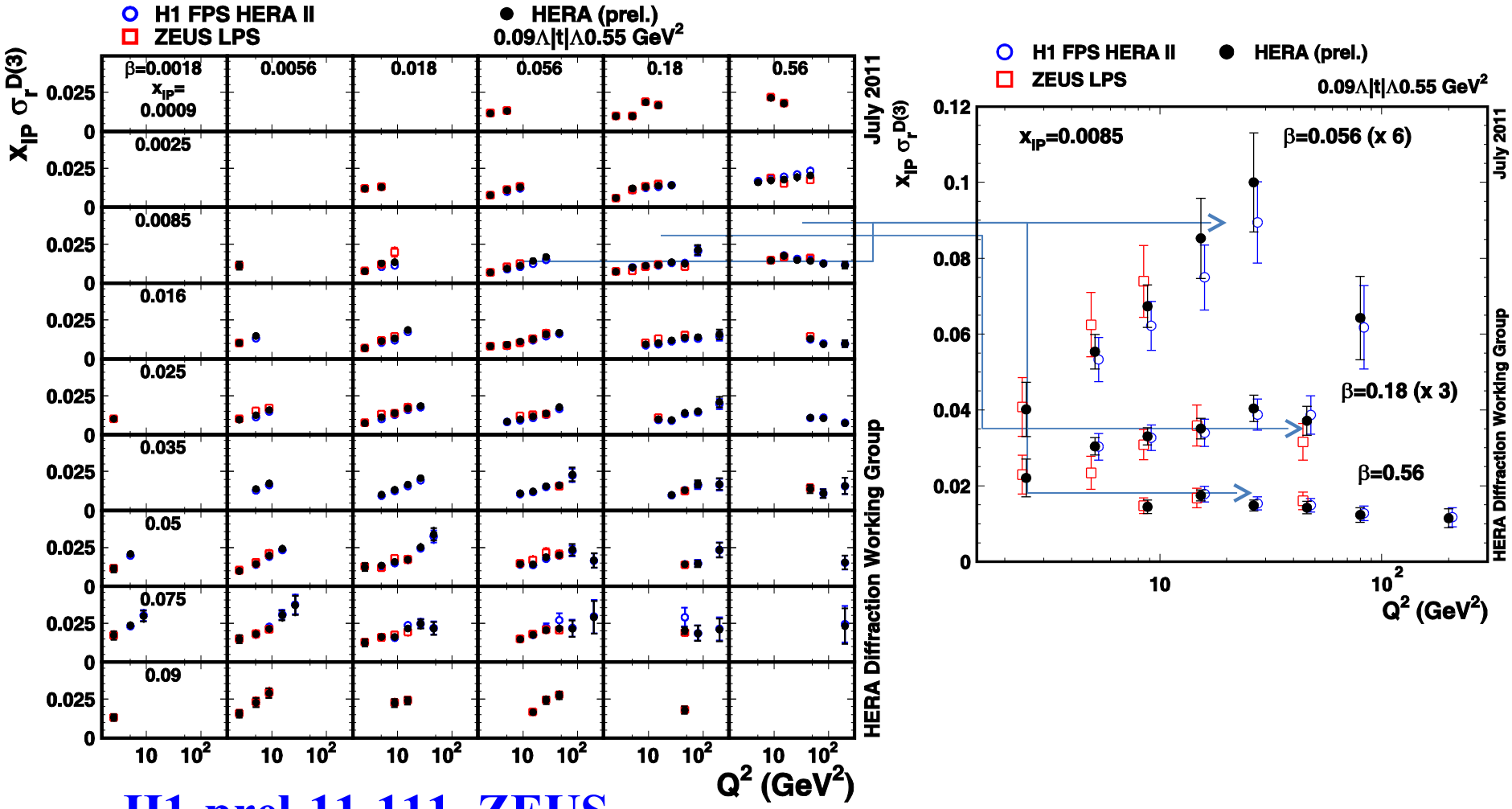
Cross sections and F2, xF3



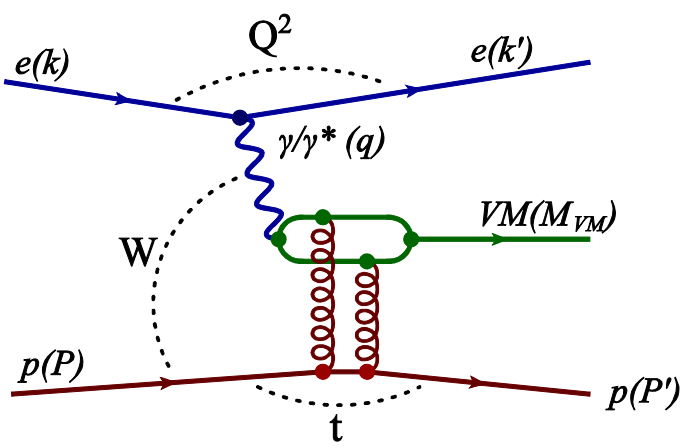
handle on valence PDFs

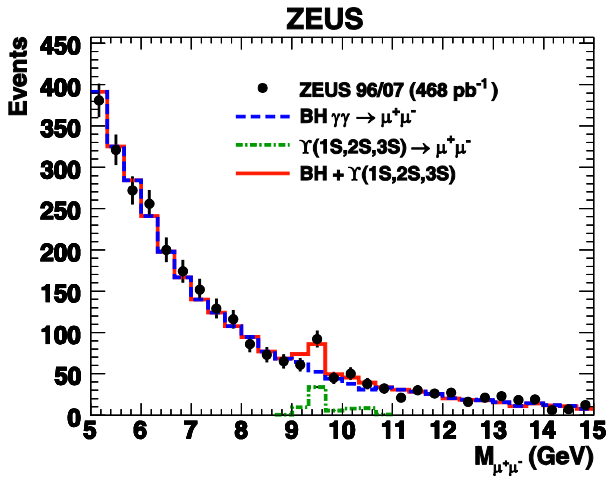
ZEUS-prel-11-002

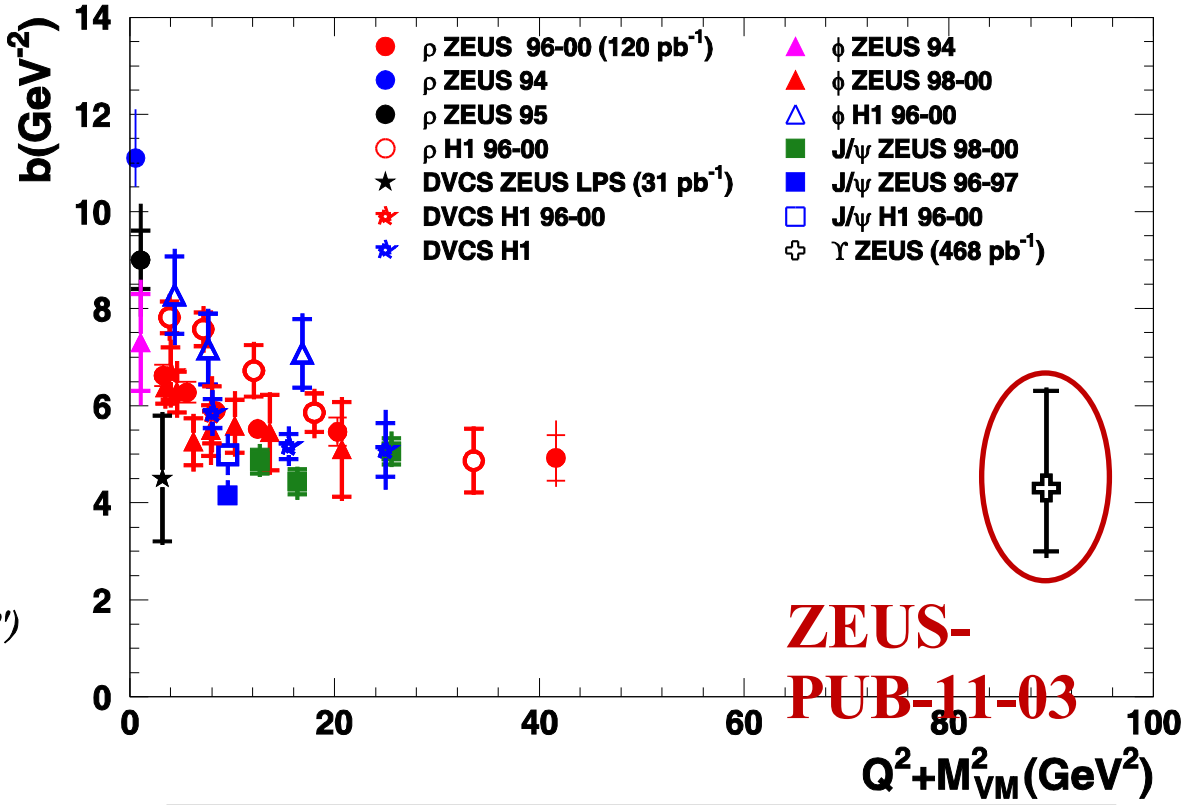
First combined results in diffraction: FPS/LPS



H1-prel-11-111, ZEUS-prel-11-011







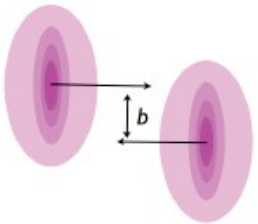
ZEUS-PUB-11-03

$r_{glue} = 0.56$ fm

$r_{proton} = 0.8$ fm

Frankfurt - Strikman

p p at LHC

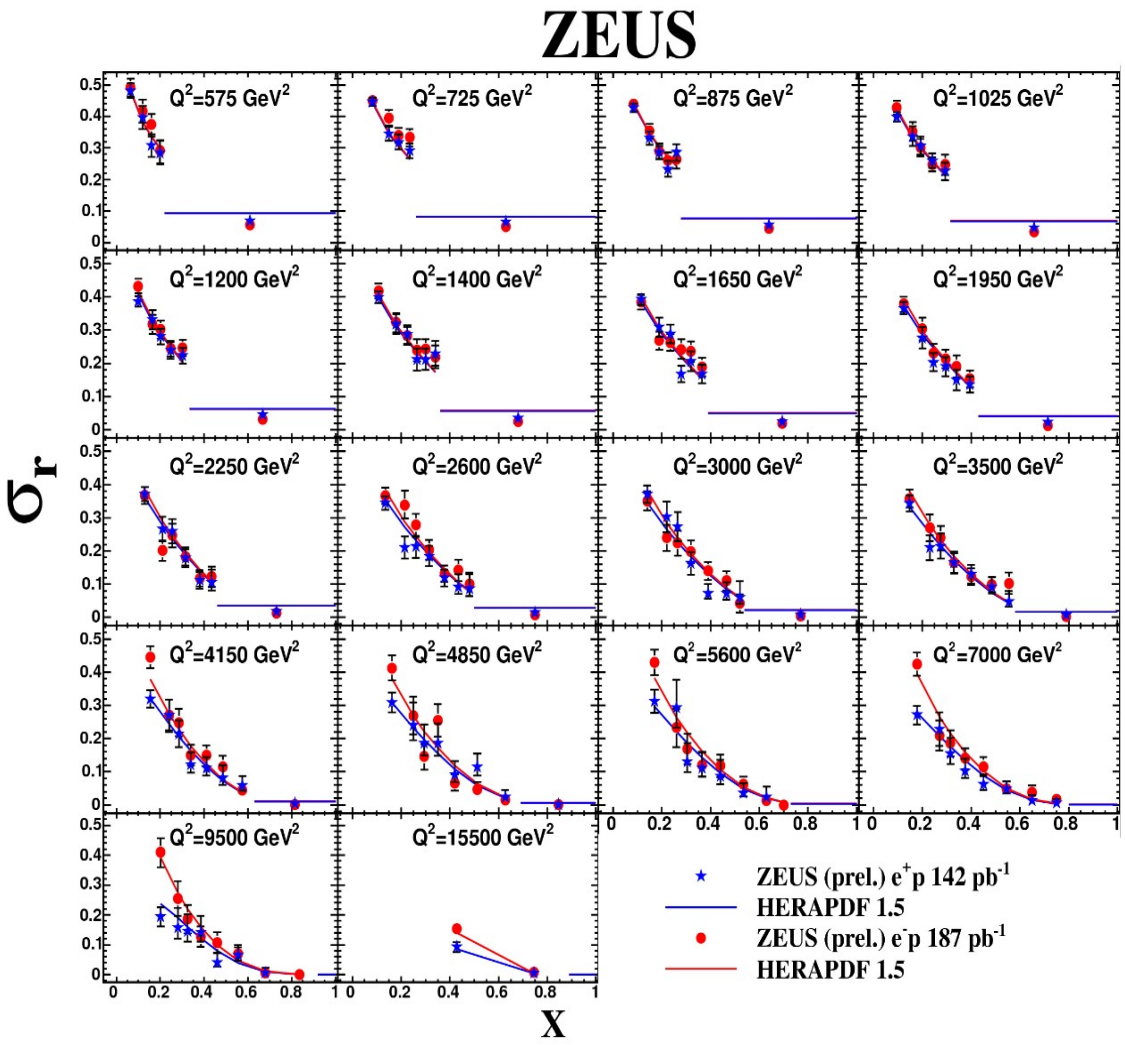


Look ‘inside’ the proton

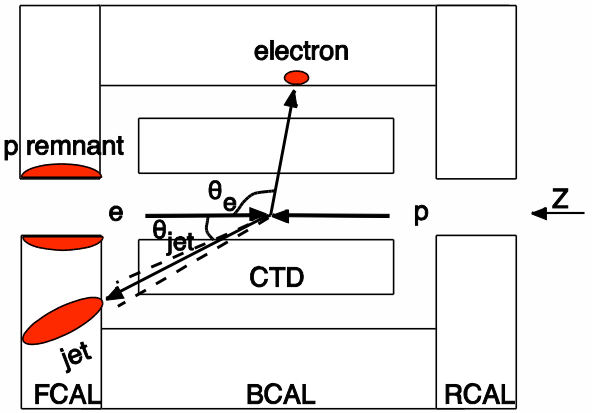
Ioffe: The probing photon can fluctuate into a qqbar state and back into a photon. In the proton rest frame and large Q2, the fluctuation time is:

At low x, the qqbar pair travels 10-100fm before interacting with the proton; one studies the structure of the vacuum.

To see ‘inside’ the proton – one has to go to high x (x > 0.1) and to high Q2.



ZEUS-prel-11-004



What next?

It is unlikely that the picture obtained from HERA so far will change.

However, its precision will keep improving till all da

Kodak instamatic x-45

Canon EOS 16.1 MP

What next?

It is unlikely that the picture obtained from HERA so far will change

However, its precision will keep improving till all dat

Kodak instamatic x-45

Leica M9 18 MP

If HERA were still running…