Reproduction of QCD analysis on combined H1+ZEUS data sets[1] and muon charge asymmetry measurements at 8TeV[2]

Hamburg, DESY CMS 2016

HERAPDF2.0

Data files:

- HERA1+2_NCep_920
- HERA1+2_NCep_820
- HERA1+2_NCep_575
- HERA1+2_NCep_460
- HERA1+2_NCem
- HERA1+2_CCep
- HERA1+2_CCem

Main parameters[1]

- NLO approach
- DGLAP ev. eq.
- $Q_o^2 = 1.9$ GeV
- RT OPT heavy flavor scheme
- $\alpha_s = 0.118$
- $f_s = 0.4$

Electroweak parameters:

- $m_{ch} = 1.47$ GeV
- $m_b = 4.5$ GeV

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1. Combination of Measurements of Inclusive Deep Inelastic $e^{\pm}p$ Scattering Cross Sections and QCD Analysis of HERA Data (DESY-15-039 June 5, 2015)

http://www-zeus.desy.de/zeus_papers/ZEUS_PAPERS/DESY-15-039.pdf

Parameterization

	A	B	C	D	E	A`	B`	C`
xg	0.0	-0.06	8.5			1.41	-0.15	25 (Cons)
xu_v	0.0	0.74	4.69		9.22			
xd_v	0.0	0.76	4.37					
xUbar	0.0	0.0	3.55	1.0				
xDbar	0.19	-0.15	4.05					

0.0 – derives from the sum rules

0.0 – derives from BxUbar = BxDbar

0.0 – derives from AUbar=ADbar(1-f_s)

Model and parameterization uncertainties

Variation	Standard Value	Lower limit	Upper limit
Q^2_{min} [GeV^2]	3.5	2.5	5.0
M_{ch} (NLO) [GeV]	1.47	1.41	1.53
M_b (NLO) [GeV]	4.5	4.25	4.75
f_s	0.4	0.3	0.5
μ_{f_o} [GeV]	1.9	1.6	2.2*

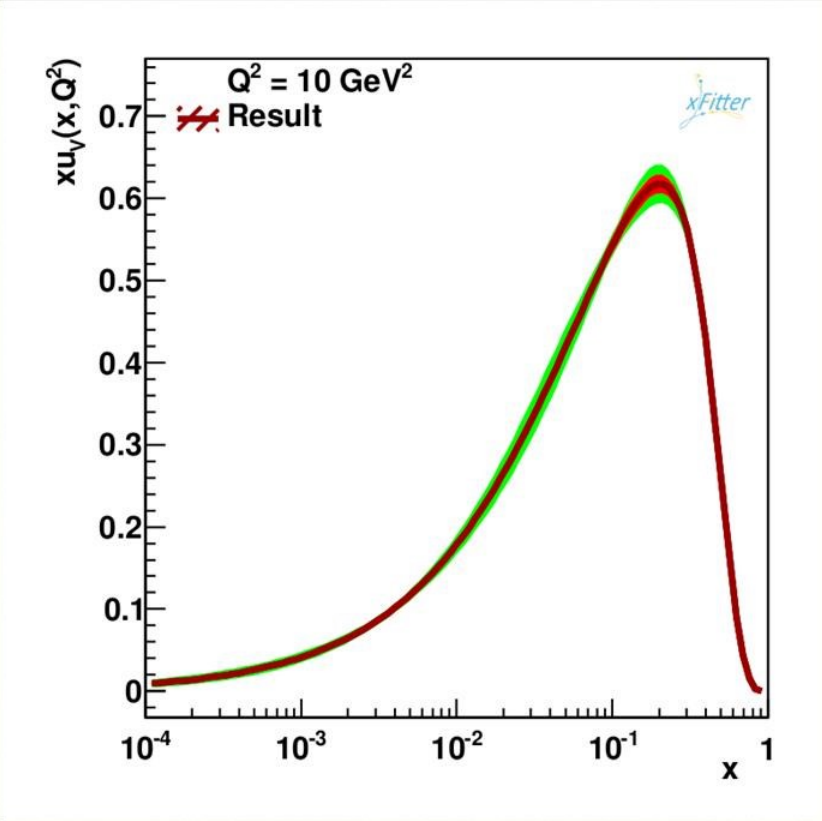
	A	B	C	D	E	A`	B`	C`
xg	0.0	-0.06	8.5	5.0	5.0	1.41	-0.15	25 (Cons)
xu_v	0.0	0.74	4.69	5.0	9.22			
xd_v	0.0	0.76	4.37	5.0	5.0			
xUbar	0.0	0.0	3.55	1.0	5.0			
xDbar	0.19	-0.15	4.05	5.0	5.0**			

* M_{ch} = 1.53 GeV to assure $\mu^2_{f_o} < M^2_{ch}$

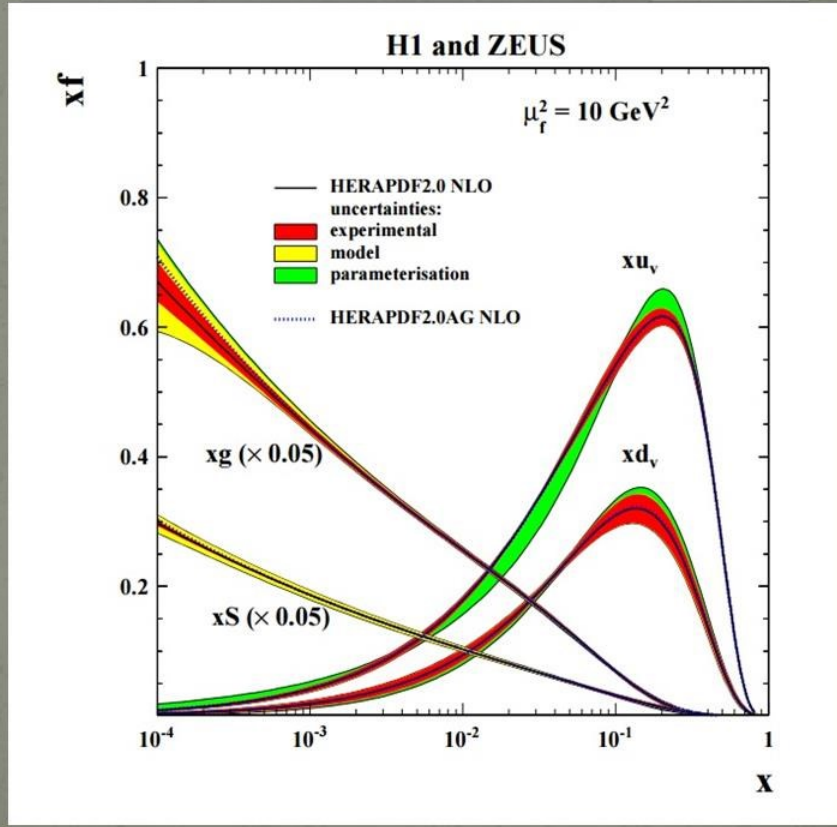
** Parameters D and E were added separately for each PDF (step = 2.5)

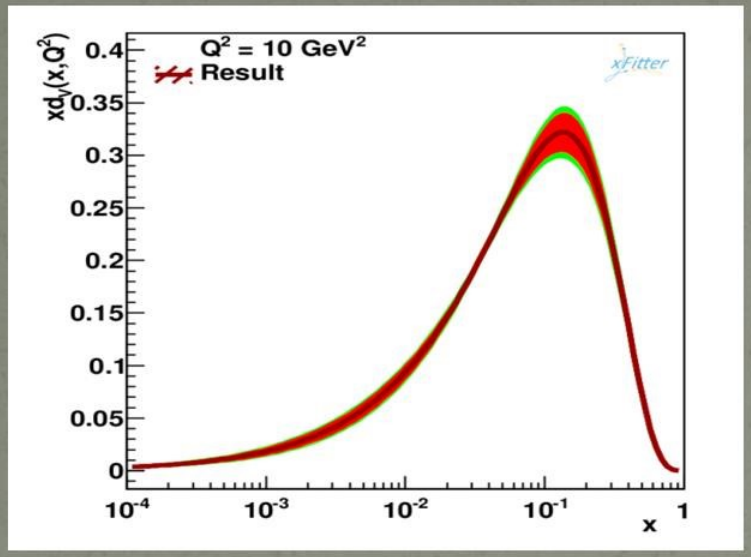
Comparison to published[1] results

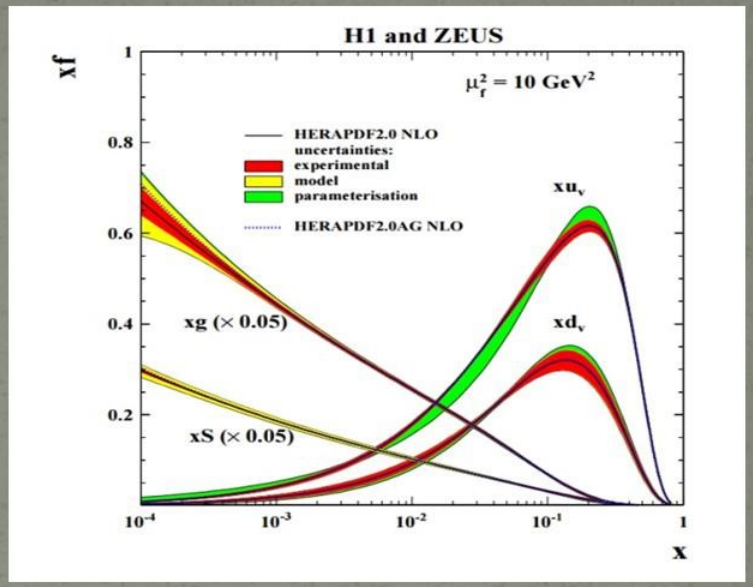
Reproduction

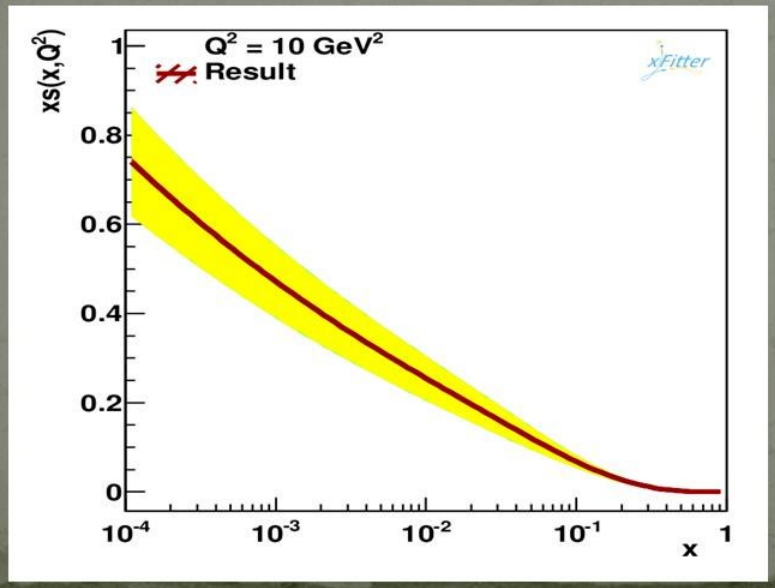


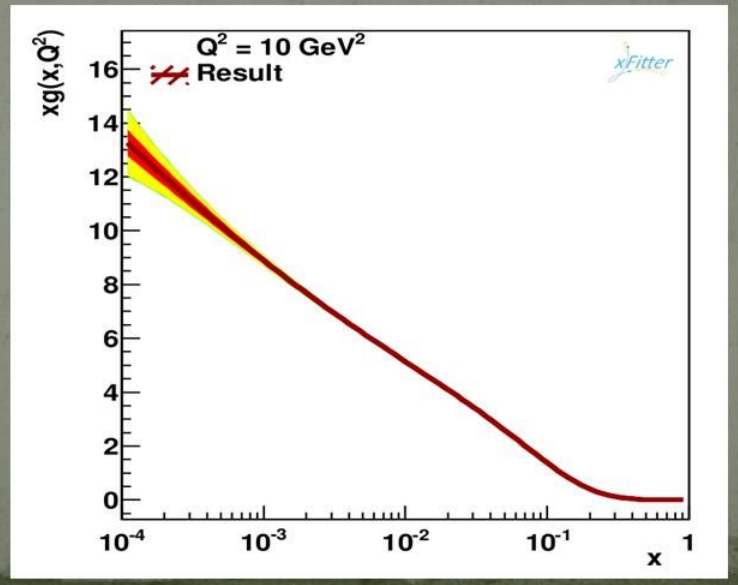
H1 and ZEUS




Q^2 = 10 GeV^2
Result
xFitter
$xd_v(x,Q^2)$
x


H1 and ZEUS
μ_f^2 = 10 GeV^2
HERAPDF2.0 NLO
uncertainties:
experimental
model
parameterisation
HERAPDF2.0AG NLO
xu_v
xd_v
xg (× 0.05)
xS (× 0.05)
xf
x


Q^2 = 10 GeV^2
Result
xFitter
$xs(x,Q^2)$
x


Q^2 = 10 GeV^2
Result
xFitter
$xg(x,Q^2)$
x

Parameter output comparison

Paper result

	A	B	C	D	E	A`	B`
xg	4.37	-0.015	9.11			1.048	-0.167
xu_v	4.07	0.714	4.84		13.4		
xd_v	3.15	0.806	4.08				
xUbar	0.105	-0.172	8.06	11.9			
xDbar	0.176	-0.172	4.88				

Output

	A	B	C	D	E	A`	B`
xg	0.0	-0.015	9.07			1.032	-0.167
xu_v	0.0	0.713	4.84		13.41		
xd_v	0.0	0.804	4.07				
xUbar	0.0	0.0	8.05	11.86			
xDbar	0.175	-0.172	4.87				

Muon charge asymmetry measurements for pp -> $W^{\pm}$+X production at $\sqrt{s} = 8$ TeV[2]

Data files:

- HERA1+2_NCep_920
- HERA1+2_NCep_820
- HERA1+2_NCep_575
- HERA1+2_NCep_460
- HERA1+2_NCem
- HERA1+2_CCep
- HERA1+2_CCem
- CMS_mAsymmetry_SMP_14_022_Kfactors

+

CMS_mAsymmetry_SMP_14_022___CMS_mAsymmetry_SMP_14_022.corr

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2. Measurement of the differential cross section and charge asymmetry for inclusive pp -> $W^{\pm}$+X production at $\sqrt{s} = 8$ TeV https://arxiv.org/abs/1603.01803

Main parameters[2]

- NNLO approach
- DGLAP ev. eq.
- $Q_o^2 = 1.9$ GeV
- RT heavy flavor scheme
- $\alpha_s = 0.118$
- $f_s = 0.31$

Electroweak parameters:

- $m_{ch} = 1.43$ GeV
- $m_b = 4.5$ GeV

Parametrization

	A	B	C	D	E	A`	B`	C`
xg	0.0	-0.06	8.5			1.41	-0.15	25 (Cons)
xu_v	0.0	0.74	4.69		9.22			
xd_v	0.0	0.76	4.37					
xUbar	0.0	0.0	3.55	1.0				
xDbar	0.19	-0.15	4.05					

0.0 – derives from the sum rules

0.0 – derives from BxUbar = BxDbar

0.0 – derives from AUbar=ADbar(1-f_s)

Model and parameterization uncertainties

Variation	Standard Value	Lower limit	Upper limit
Q^2_{min} [GeV^2]	3.5	2.5	5.0
M_{ch} (NLO) [GeV]	1.37	1.43	1.49
M_b (NLO) [GeV]	4.5	4.25	4.75
f_s	0.31	0.27	0.39
~~$\mu^2_{f_0}$ [GeV]~~	~~1.9~~	~~1.6~~	~~2.2*~~

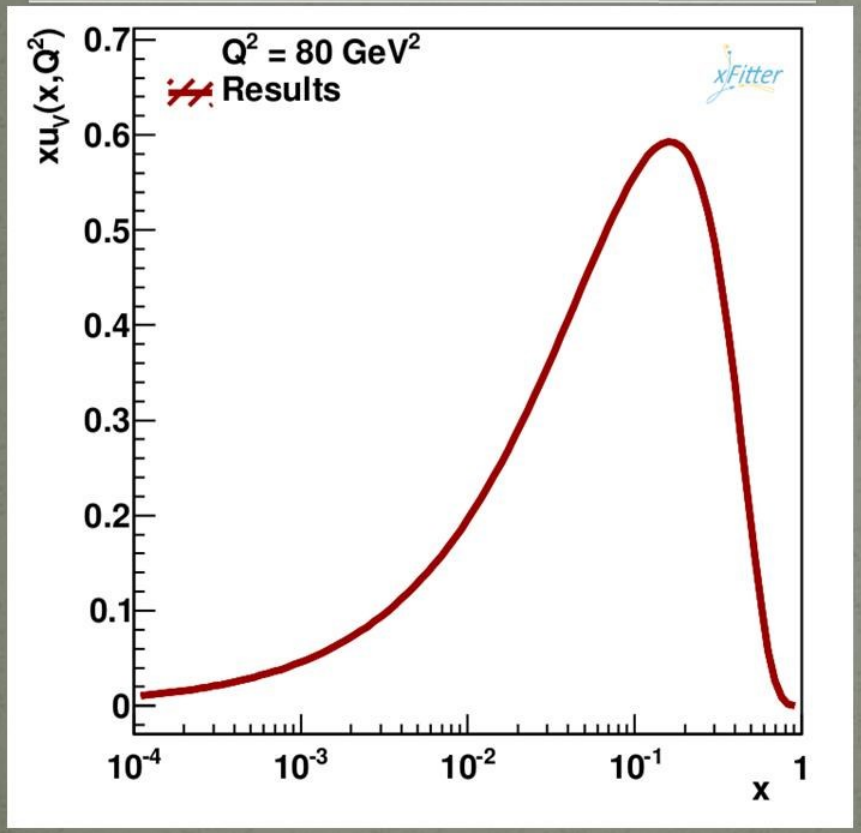
	A	B	C	D	E	A`	B`	C`
xg	0.0	-0.06	8.5	5.0	5.0	1.41	-0.15	25 (Cons)
xu_v	0.0	0.74	4.69	5.0	9.22			
xd_v	0.0	0.76	4.37	5.0	5.0			
xUbar	0.0	0.0	3.55	1.0	5.0			
xDbar	0.19	-0.15	4.05	5.0	5.0**			

* ~~$M_{ch} = 1.53$ GeV to assure $\mu^2_{f_0} < M^2_{ch}$~~

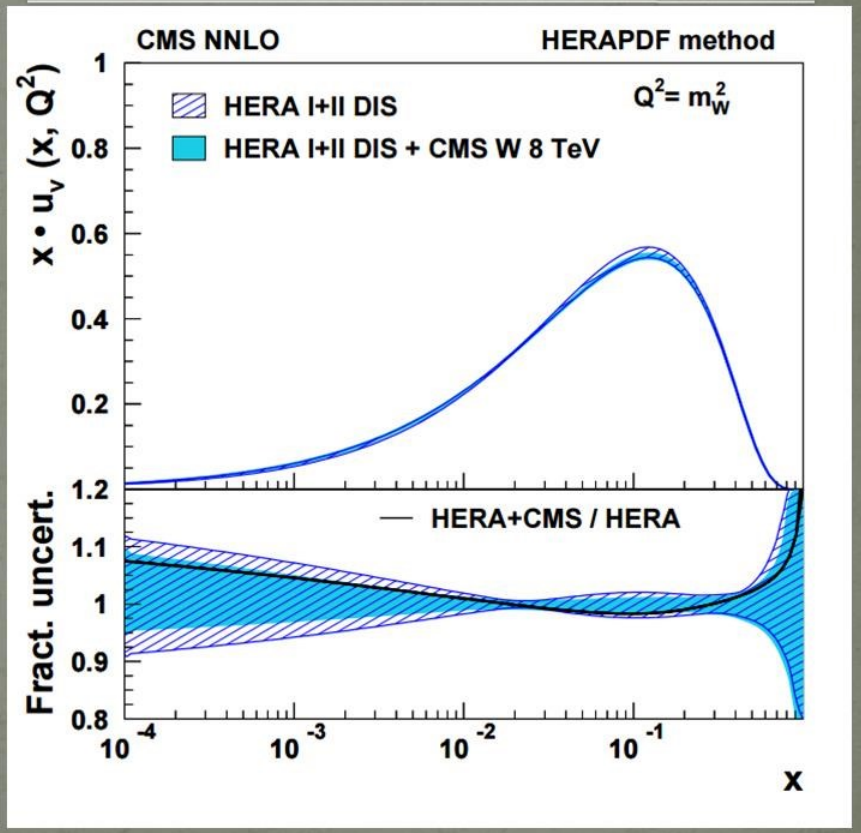
** Parameters D and E were added separately for each PDF (step = 2.5)

Comparison to published[2] results

Reproduced u_v

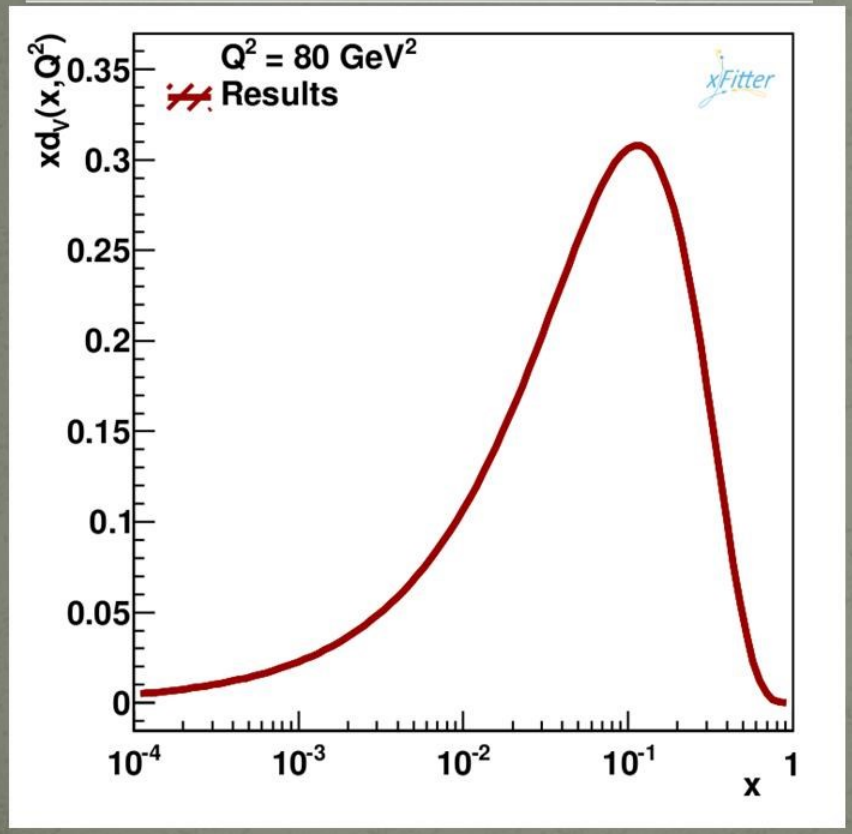


Published u_v



Comparison to published[2] results

Reproduced u_v



Published u_v