H1-prelim-15-041
ZEUS-prel-15-002
April 2015

Studies using FONLL scheme for HERAPDF2.0

H1 and ZEUS Collaborations

Abstract

Studies using FONLL schemes in the QCD fits to the combined H1 and ZEUS inclusive neutral and charged currentt $e^{\pm}p$ scattering measurements were performed at next-to- and next-to-next-to-leading order. The dependence of the goodness of the fit, $\chi^2/d.o.f$, as function of the choice of the Q^2_{min} applied to data is presented.

1 FONLL Schemes' description

The FONLL scheme [1, 2] for the heavy quark treatment is used by the NNPDF PDF Group [3] and it is the latest scheme available through the HERAFitter package. The scheme is available via the APFEL [4]interface to the HERAFitter [5] package used in this analysis. It comes in different variants: FONLL-C (at NNLO), FONLL-B and FONLL-A (at NLO), described briefly below:

- **FONLL -C:**
  In this scheme all the structure functions are evaluated at order of α_s^2(similarly to what is done for the ACOT scheme).

- **FONLL-B and -A:**
  Both schemes are NLO, but with different choices about the order of the heavy quark coefficient functions. In the FONLL-B and -A schemes, F_L is evaluated at order α_s at NLO. In this paper, we use FONLL-B as adopted by the NNPDF group recently.

Figure 1 shows scans of the $\chi^2/d.o.f.$ versus Q^2_{min} for fits done with the GMVFNS RTOPT, ACOT, and FONLL-B schemes, as well as with the FFNS schemes. A decrease of $\chi^2/d.o.f.$ with increasing Q^2_{min} is observed for every scheme.

Figure 2 shows scans of the $\chi^2/d.o.f.$ versus Q^2_{min} for fits done with the GMVFNS RTOPT and FONLL schemes, at both NLO and NNLO. A decrease of $\chi^2/d.o.f.$ with increasing Q^2_{min} is observed for every scheme.

References

[1] " Heavy quarks in deep-inelastic scattering" S. Forte, E. Laenen, P. Nason and J. Rojo, Published in Nucl. Phys. B 834 (2010) 116, e-Print: arXiv:1001.2312 [hep-ph].

[2] "The P(T) spectrum in heavy flavor hadroproduction" M. Cacciari, M. Greco and P. Nason, JHEP **9805** (1998) 007 [hep-ph/9803400].

[3] NNPDF collaboration
`https://nnpdf.hepforge.org/`

[4] " APFEL: A PDF Evolution Library with QED corrections" V. Bertone, S. Carrazza and J. Rojo, Published in Comput. Phys. Commun. 185 (2014) 1647, e-Print: arXiv:1310.1394 [hep-ph]

[5] "HERAFitter, Open Source QCD Fit Project," S. Alekhin, O. Behnke, P. Belov, S. Borroni, M. Botje, D. Britzger, S. Camarda and A. M. Cooper-Sarkar *et al.*, arXiv:1410.4412 [hep-ph].
`www.herafitter.org`

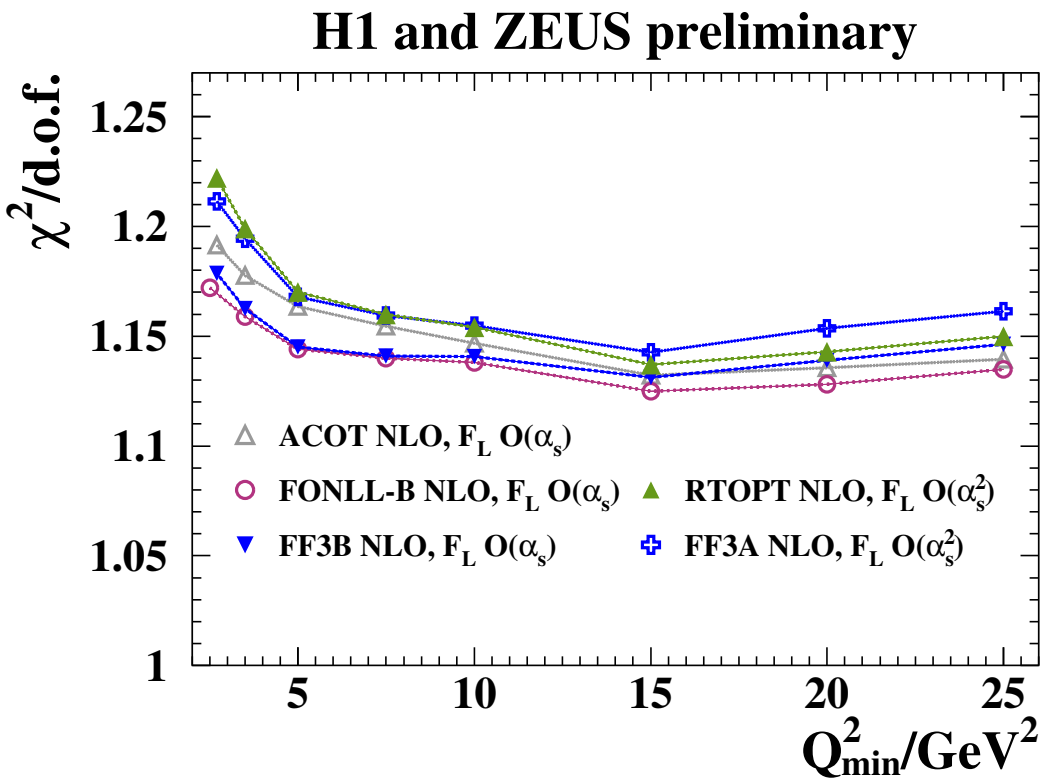

Figure 1: The dependence of $\chi^2/d.o.f.$ on Q^2_{min} for HERAPDF2.0 NLO fits using the RTOPT,ACOT, FONLL-B and fixed-flavour (FF) schemes, with the FL contribution calculated using matrix elements of the order of α_s as indicated in the legend.

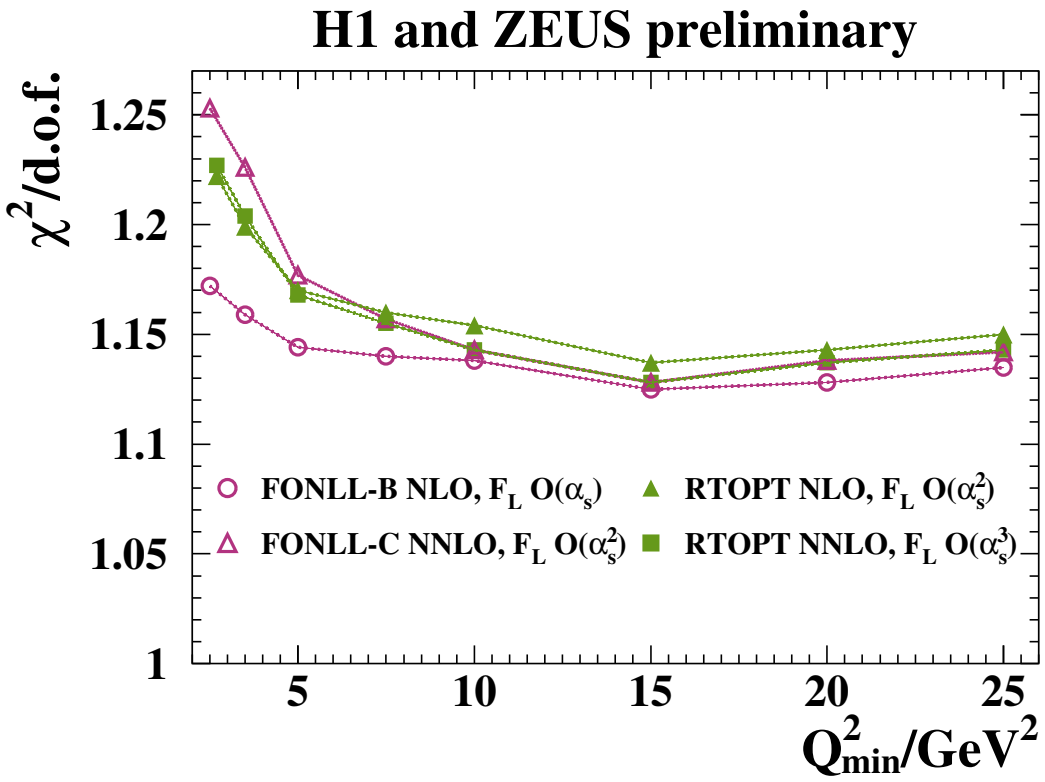

Figure 2: The dependence of $\chi^2/d.o.f.$ on Q^2_{min} for HERAPDF2.0 fits using the RTOPT and FONLL schemes at NLO and NNLO.