W charge asymmetry studies

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Introduction

"The measurement of W charge asymmetry at 13 TeV with the CMS detector and a global QCD analysis using the CMS and ATLAS data on this asymmetry."
Main steps:

- Repeat calculation of W asymmetry at 8TeV + global fit

- K-factors production at 13 TeV using MCFM-8.0 + mcmf-bridge development
- Calculation of grids of W production at 13 TeV in NNLO approach + global fit
- Global fit using the CMS and ATLAS data on W charge asymmetry + comparison with calculated results

First calculation of the 8 TeV grids

Comparison to published results "Measurement of the differential cross section and charge asymmetry for inclusive $pp \to W^{\pm} + X$ production at $\sqrt{s} = 8$ TeV" arXiv:1603.01803v2.
The input parameters were taken the same as Ringaile Placakyte has used in her production.

Paper input:

- $p_{T_l} > 25$ GeV
- $|\eta_l| < 2.4$
- MCFM-6.8(NLO)+APPLgrid-1.4.56
- HERAPDF1.5 NLO
- mcfm-bridge 0.0.28
- $m_t = 173.0$ GeV
- $m_b = 4.75$ GeV
- $m_c = 1.43$ GeV

Reproduction of the published 8 TeV grids

- MCFM-6.8+APPLgrid-1.4.70 (or APPLgrid-1.4.56 - doesn't matter)
- mcfm-bridge 0.0.28
- mcmf-bridge 0.0.35

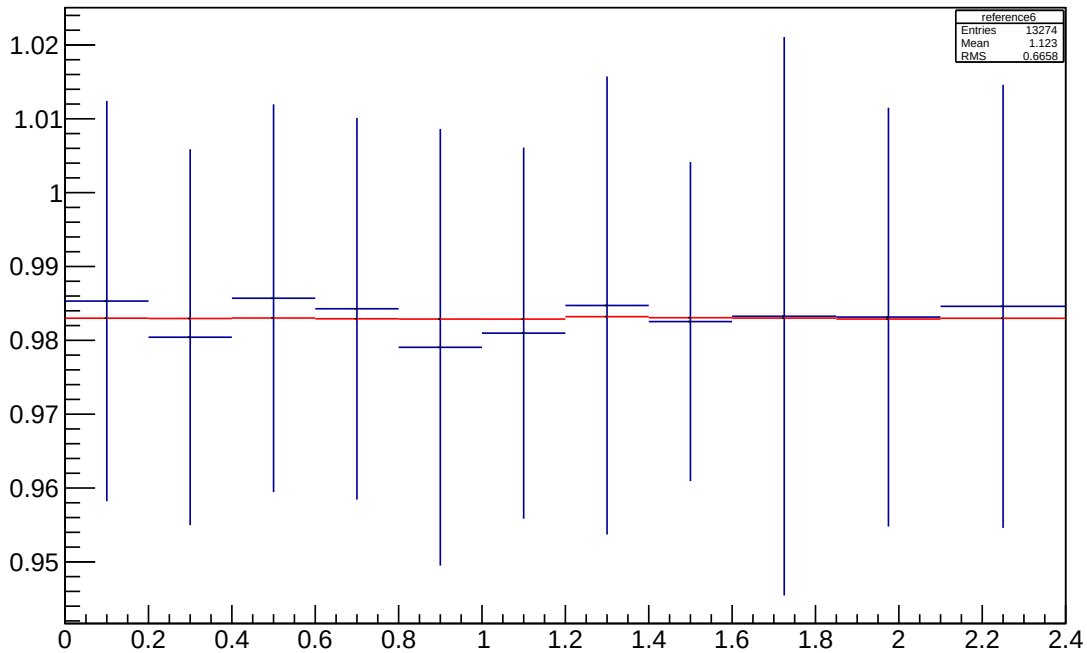

Figure: Bridges comparison

Reproduction using HERAPF15 NLO ALPHAS(α_s= 0.114)

- MCFM-6.8+APPLgrid-1.4.70 (or APPLgrid-1.4.56 - doesn't matter)
- HERAPF15 NLO ALPHAS($\alpha_s = 0.114$)
- HERAPF15 NLO EIG ($\alpha_s = 0.1176$)

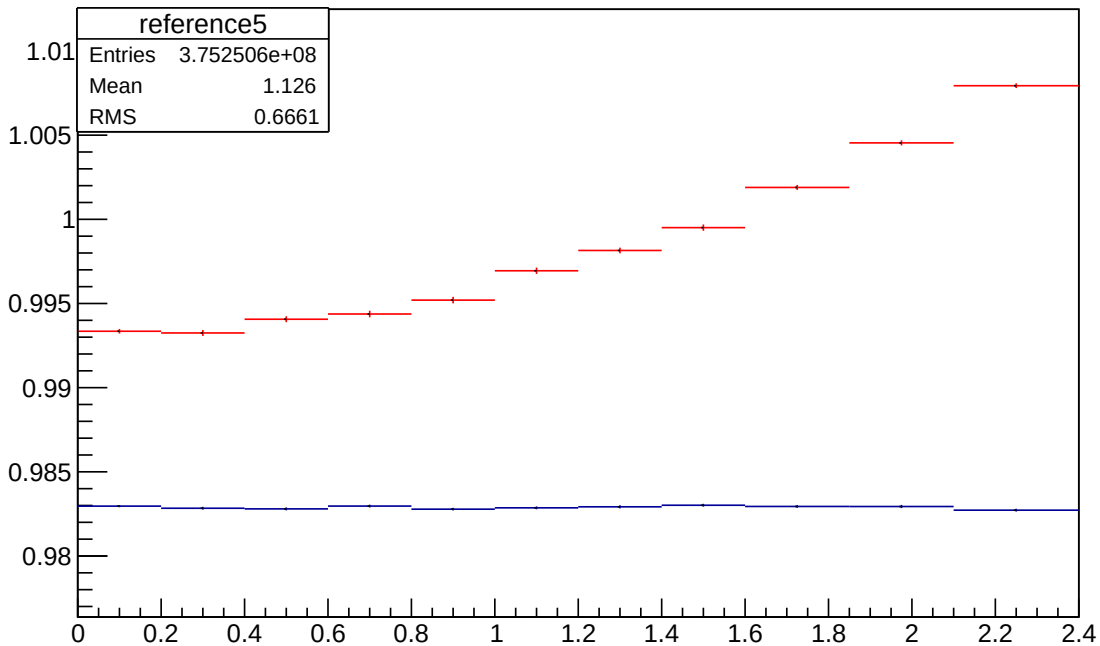

Figure: HERAPDFs comparison

W asymmetry

$$A(\eta) = \frac{\sigma_\eta^+ - \sigma_\eta^-}{\sigma_\eta^+ + \sigma_\eta^-}$$

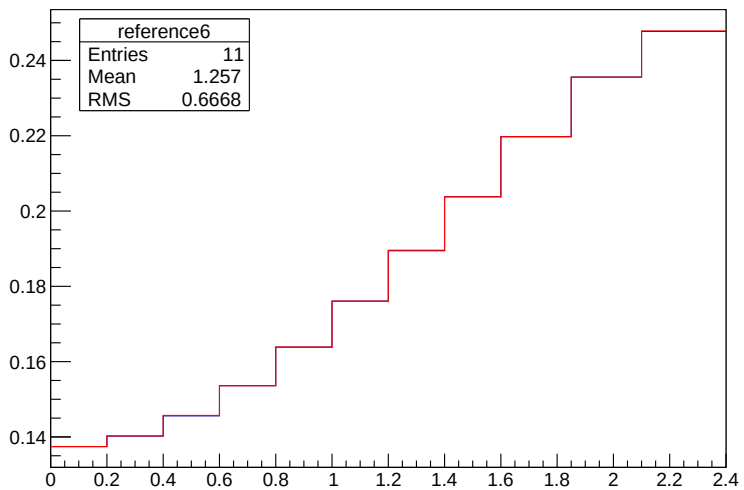

Figure: W asymmetry comparison

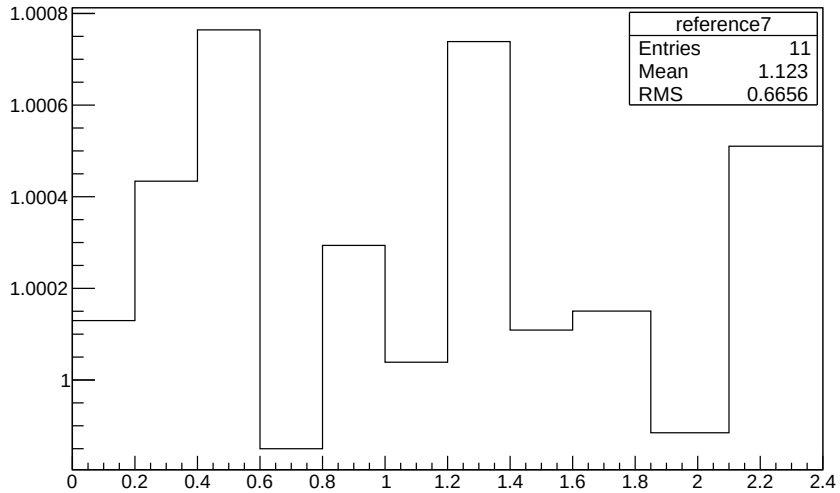

Figure: W asymmetry ratio

mcmf-bridge development

- MCFM is a parton-level Monte Carlo program that gives NLO predictions for a range of processes at hadron colliders.
- mcfm-bridge is a link between MCFM and APPLgrid.
- in May 25th, 2016 the latest version - MCFM-8.0 was released.
- MCFM-8.0 can calculate $W^{+/-}$ and Z^0 in NNLO approach.
- New version of mcfm-bridge would allow us to use grids in NNLO, which is good!
- The process has started 20th of February and will be going near 3-4 weeks in cooperation with Pavel Starovoitov (Heidelber University).

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Future plans

- mcfm-bridge
- BCM1F

"The Truth Is Out There..."

SA F.Mulder