8 and 13 TeV Powheg-ew predictions

Aleko Khukhunaishvili

University of Rochester

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Setup

- Observable: Born level $A_4(m, y)$
- (LO, NLO, NLO+HO) EW Powheg + NLO QCD
  generated with Powheg Z(_ew) + Pythia8
- $\sin^2 \theta^{\ell}_{\text{eff}}$: 0.23150($\pm$0.00050)
- NNPDF31_nnlo_hessian_pdfas
- 6 equal $y_{\ell\ell}$ bins with width of 0.4
- 7 $m_{\ell\ell}$ bins: **52**,66,76,86,96,106,116,150

- muon and electron channels
- increased stats in previous setup:
  total of about 5B 8TeV and 10B 13 TeV events

Samples and configurations

Configurations

- 8 and 13 TeV
- lo, nlo, nlo+ho EW corrections
- ($\sin^2\theta^{\ell}_{\text{eff}} = 0.2310, 0.2320$ variations done via reweighting)

3 sets of samples:

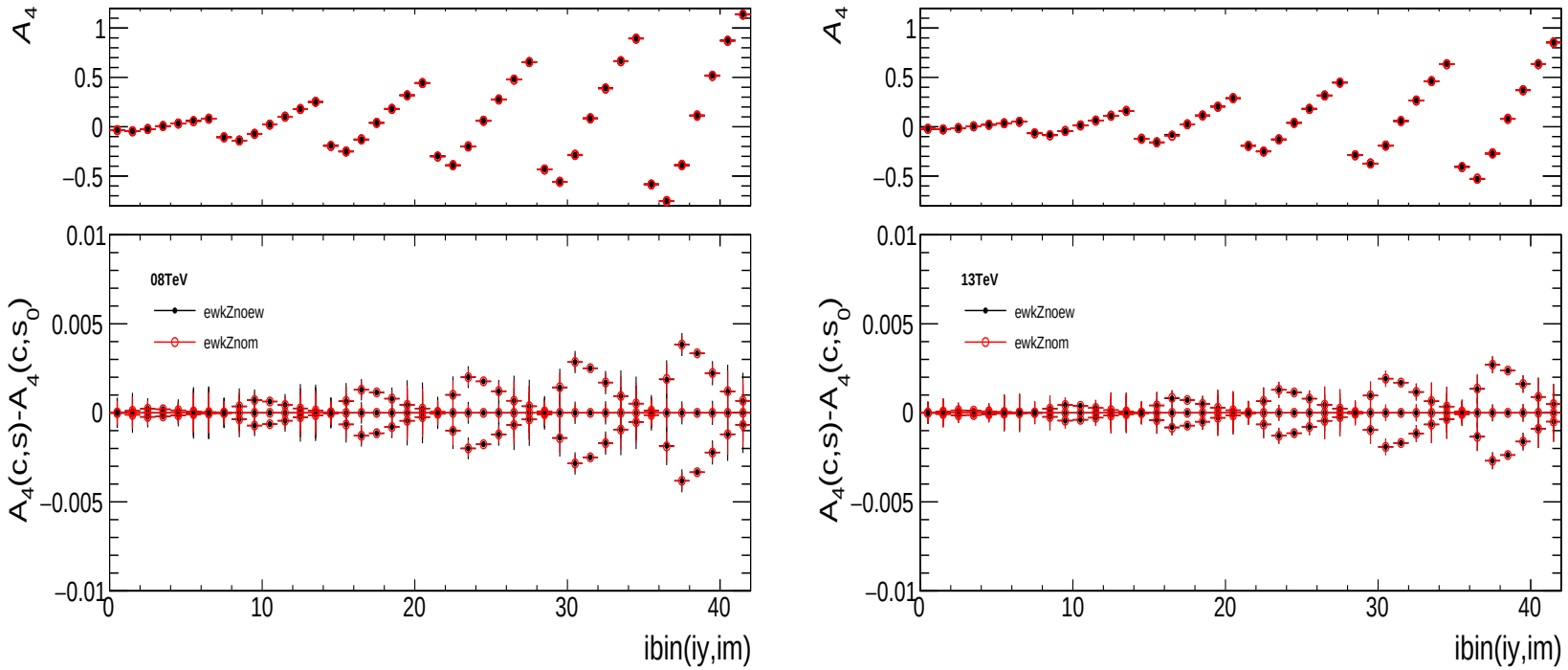
v4 lo and nlo EW

v5 fine-tunned EW parameters to match with Fulvio and Elzbieta, added nlo+ho predictions, increased precision

v7 first try with Powheg manyseeds option (no success)

A_4 variations with $\sin^2\theta^\ell_{\text{eff}}$

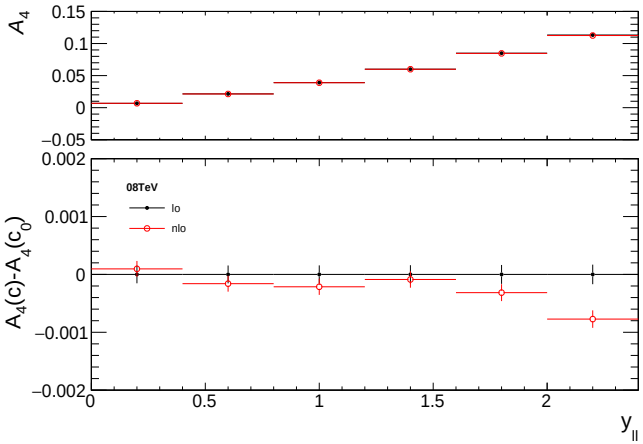
- changes in predictions for different $\sin^2\theta^\ell_{\text{eff}}$ inputs are evaluated with Powheg reweighting



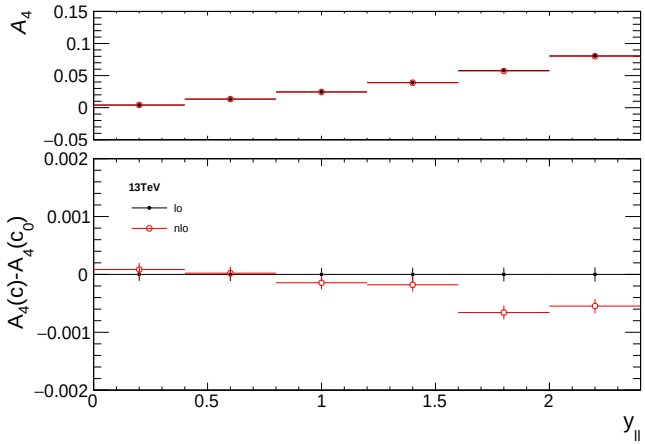
- δA_4 is identical in lo- and nlo-ew configurations in $\sin^2\theta^\ell_{\text{eff}}$-input scheme

Difference between LO and NLO EW predictions

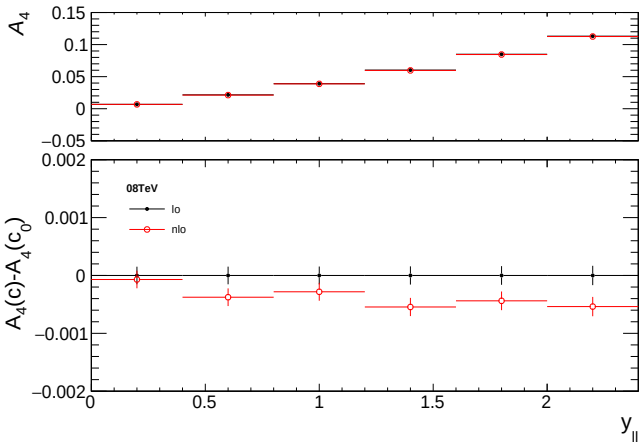
LO vs NLO EW $A_4(y)$ in Z peak (81,101) region



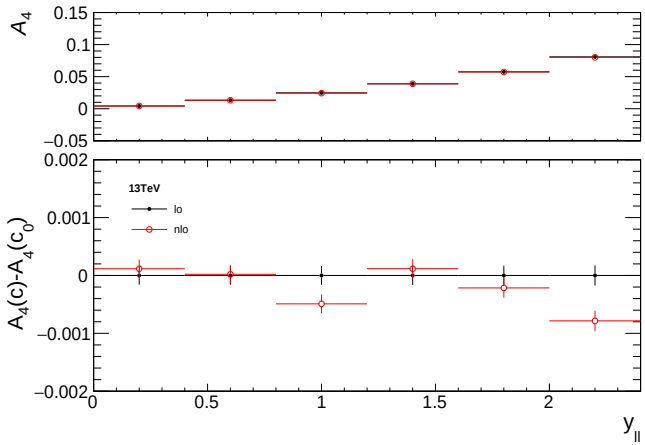
V4: $+7 \pm 3$ (8TeV)



$+17 \pm 2$ (13TeV)



V5: $+15 \pm 3$ (8TeV)



-1 ± 4 (13TeV)

Eliminate Powheg grid calculation uncertainty

1. – generate one very precise gridpack (several days running)
   – use it to generate all events
   – v4 and v5 are generated like this

2. – Use Powheg *manyseeds* option
   – use somewhat reduced precision per seed
   – ($<\sim$ 24h running for the longest step)
   – results are merged after each calculation step (5 total)
   – tried in v7 with 200 seeds
   – (so far no success)

3. – generate many less-precise independent gridpacks
   – use different ones for different sets of events
   – (todo if manyseeds turns out too difficult)

Status and next

- Procedure for cross checks and combination among experiments more or less set
- Some differences in central predictions of previous iterations of pseudo-data that probably need to be understood
- Need to obtain same (or within hopefully small QCD uncertainty) LO, NLO, NLO+HO EW absolute A_4 predictions for same input $\sin^2\theta^{\ell}_{\text{eff}}$ and PDF set

  – even better if this can be achieved using different tools
- Need to add forward electron channel