

# Towards Tevatron / LHC combinations

# Status

- Current most meaningful measurements:
  - CDF (2.2 fb<sup>-1</sup>) :  $80387 \pm 19$  MeV
  - D0 (5.3 fb<sup>-1</sup>) :  $80376 \pm 23$  MeV
  - ATLAS (4.6 fb<sup>-1</sup>):  $80370 \pm 19$  MeV,
- Several statements on the combined uncertainty appearing in recent literature
  - PDG / Jens Erler :  $\delta m_W = 12$  MeV “assuming 7 MeV of common uncertainty”
    - Moriond talk : <https://indico.in2p3.fr/event/13763/contributions/15199>
  - Gfitter :  $\delta m_W = 13$  MeV, most frequent value obtained scanning over PDF correlations
    - <http://inspirehep.net/record/1658767>
  - HEPFit :  $\delta m_W = 12$  MeV (<http://inspirehep.net/record/1630895>)
- All this is plausible, and on our side we find uncertainties ranging between 11 and 13 MeV for uncorrelated or fully correlated PDF uncertainties.
- We can not fully exclude anti-correlated uncertainties, though (cf. LHCb study)

# Status

- Uncertainty correlations
  - PDFs
  - EWK / QED corrections
  - W width
- Uncertainties counted in the ATLAS measurement, and not explicitly covered by the Tevatron :
  - Z  $\rightarrow$  W extrapolation uncertainty in the pT distribution
  - Spin correlations
- PDF correlations?
  - ATLAS : used CT10 for best model + uncertainties
  - D0 : CTEQ6.6 for best model; CTEQ6.1 for uncertainties
  - CDF : CTEQ6.6 for best model; MSTW2008 for uncertainties

# Possible approaches

- In all cases : needs mW shifts under PDF eigenset / replica variations
- Stick to PDFs used in the publications; find a way to estimate correlations?
  - Rotate PDF A into PDF B?
- Stick to central values, but evaluate uncertainties for a (set of) common PDF sets?
  - Allows studying the model dependence of the correlations
  - How to remain consistent with the published individual uncertainties?
- Mock up the measurements using generator-level predictions + smearing
  - Needs simple parametrizations for the lepton and recoil resolutions, for the individual experiments
  - Very flexible : same framework can be used for a variety of problems
    - GPD / LHCb combinations
    - Given experiment, at various energies ( $\leq 13$  TeV)
    - Prospects : mW in the HL-LHC era (enlarged acceptance; new energy point [27 TeV])

Contribution foreseen in the YR in preparation