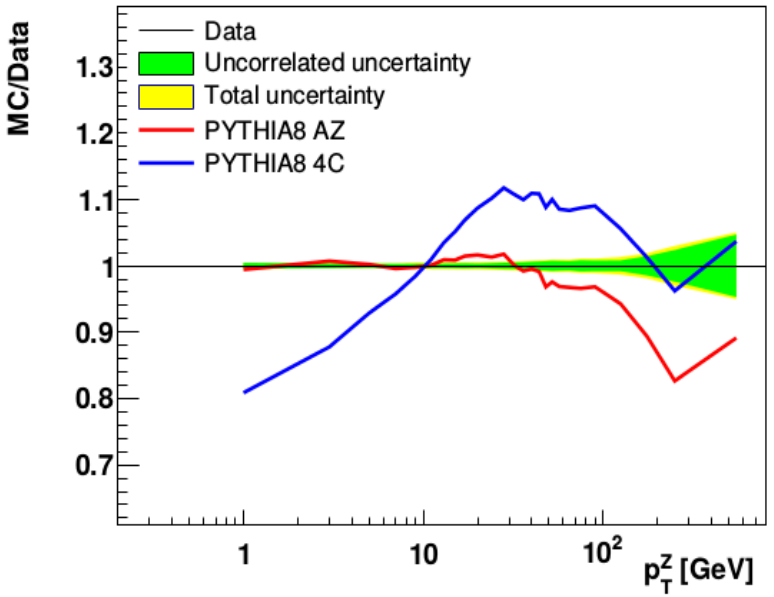
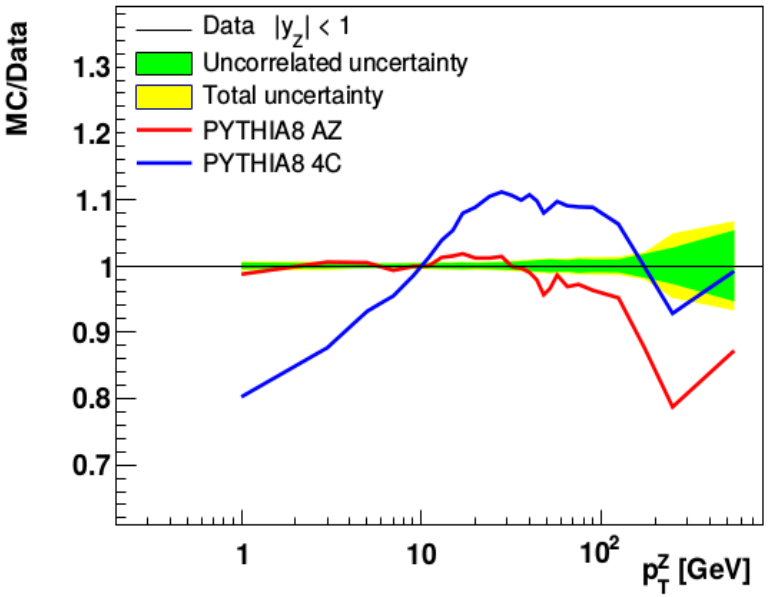
pTZ-constrained PDF uncertainties

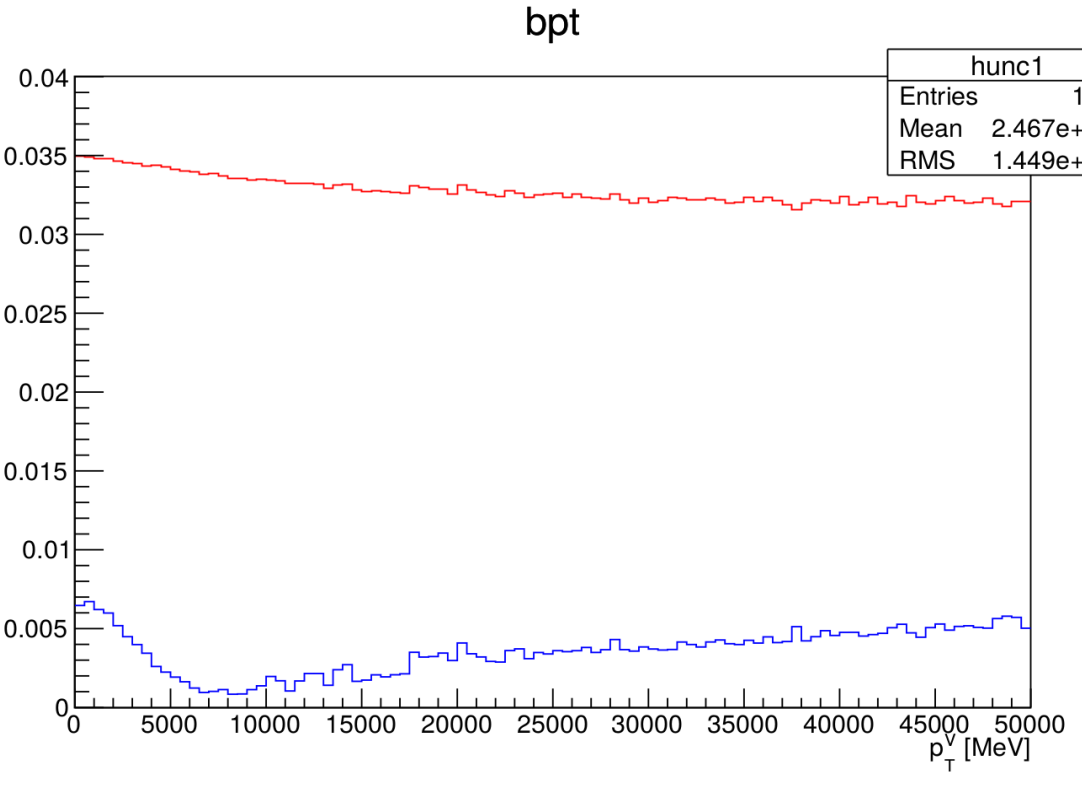
- The pTZ distribution is essentially fixed by the data (to ~0.3%). Shower tunes affect the predictions by 10-20%





pTZ-constrained PDF uncertainties

- When applying PDF variations, we re-introduce distortions to the boson pT distributions, moving away from the data. So plain PDF variations are too conservative
  - ~0.5-0.7% effect on shape, i.e. significant



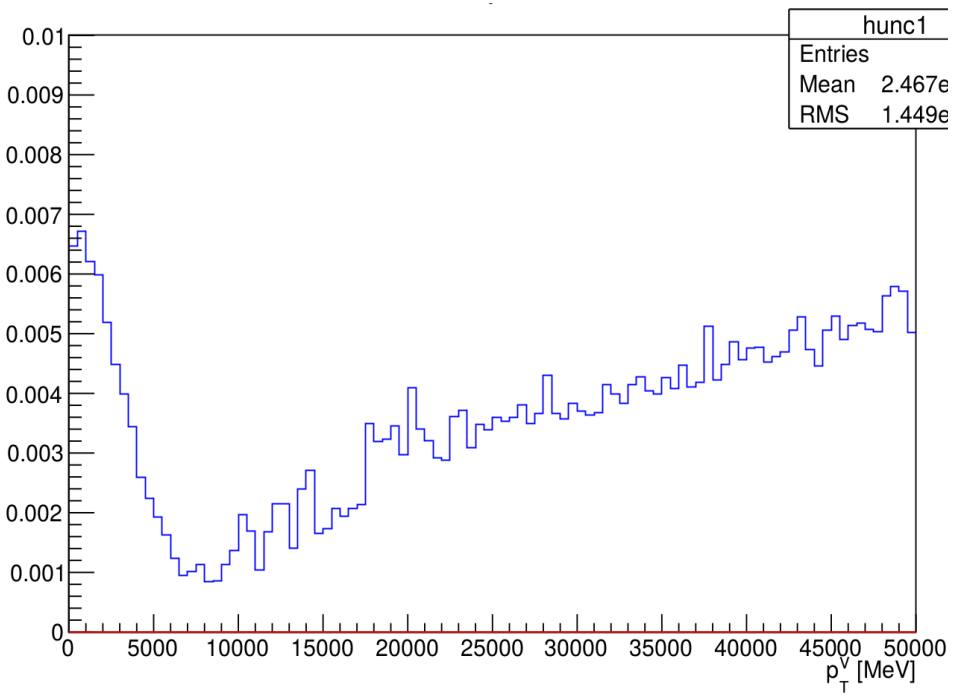
Recipe used for mW

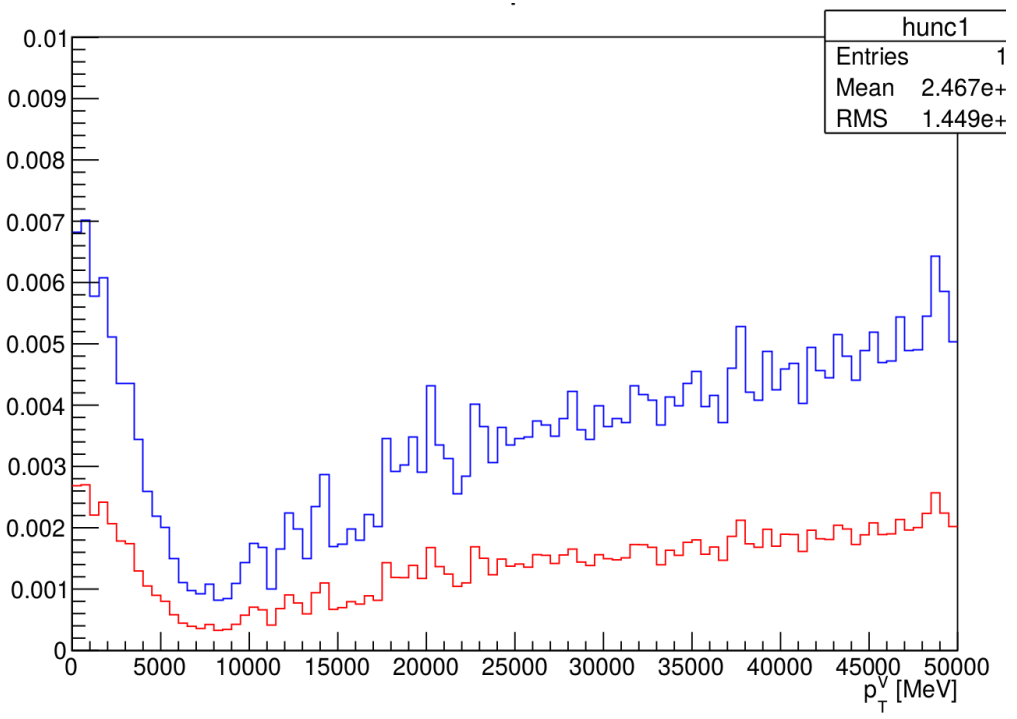
- Apply “pTZ-constrained PDF variations
  - Step 1 : calculate the pTZ distributions (h) for all PDF variations
  - Step 2 : correct the PDF weight as follows :

$$w = \frac{PDF1}{PDF2} \longrightarrow \frac{PDF1}{PDF2} \times \frac{h2(pT)}{h1(pT)}$$

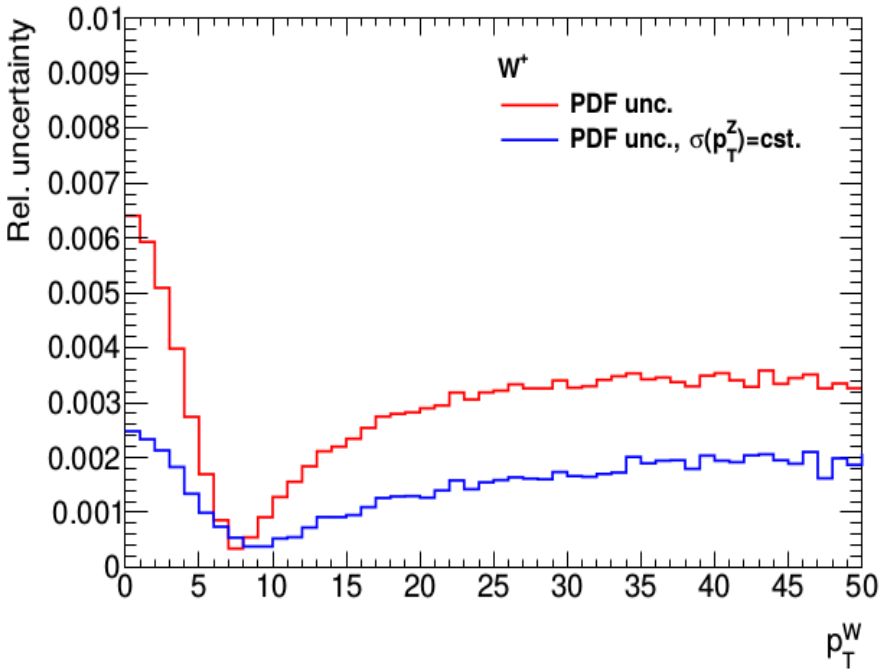
- This corrects back the pT distribution to the initial tune
  - PDF-induced effect on pT should then be 0 for Z (by construction), and reduced for W, leaving only the PDF effect on the W/Z pT ratio

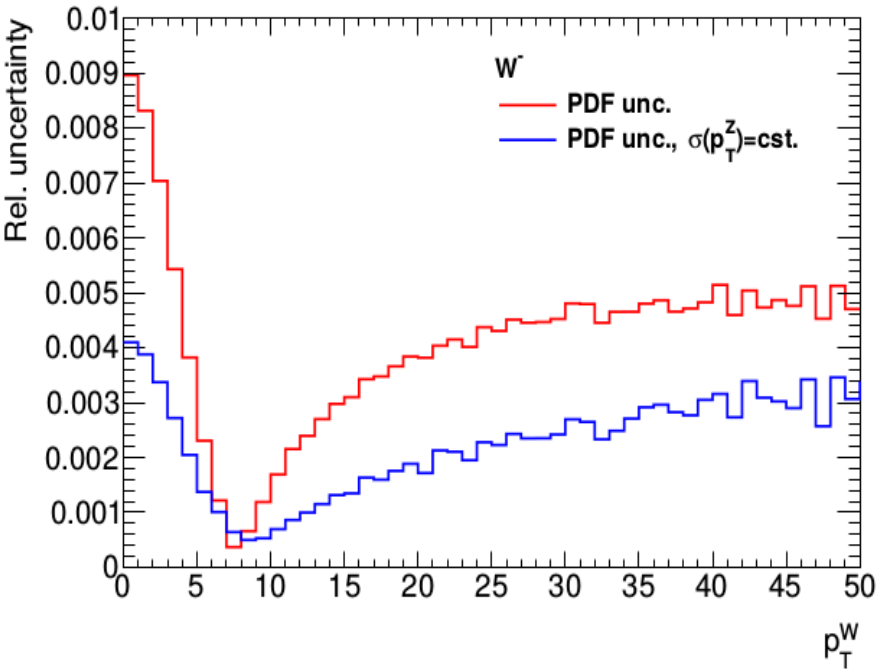
Effect on Z and W





Old note


Rel. uncertainty
W+
PDF unc.
PDF unc., σ(p_T^Z)=cst.
p_T^W


Rel. uncertainty
W-
PDF unc.
PDF unc., σ(p_T^Z)=cst.
p_T^W