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Associated production e^+e^-bb and heavy quark impact on ptZ and MW

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preliminary results of a work in collaboration with: E.Bagnaschi, F.Maltoni, M.Zaro

Improved prediction of the ptZ distribution: combining 5FS and 4FS

- the prediction of the ptZ distribution, inclusive over radiation, is split into two contributions with and without B hadrons in the final state

- we rely on the 5FS for the contributions without B hadrons (light quarks ~ massless partons)
  4FS for the contributions with B hadrons (exact massive kinematics +NLOPS acc.)
  and we combine the two results

- in the 5FS B hadrons are generated by the QCD PS with two mechanisms:
  i) presence of a bottom quark in the initial state (b bbar and bg initiated subprocesses)
  ii) gluon splitting into b bbar
  → the contribution without B hadrons is computed in the 5FS
  imposing a veto on the presence of B hadrons in the event analysis

- the contribution with B hadrons is computed in the 4FS
  by definition the process $pp \to e^+e^-$b bbar contains bottom quarks in the final state
  additional b bbar pairs may be produced by gluon splitting

$$\frac{d\sigma^{best}}{dp_\perp^{l^+l^-}} = \frac{d\sigma^{\texttt{5FS-Bveto}}}{dp_\perp^{l^+l^-}} + \frac{d\sigma^{4FS}}{dp_\perp^{l^+l^-}}$$

- need to compare with analytical resummation in SCET, where a systematic handling of all large logarithmic corrections, at each ptZ value, is implemented

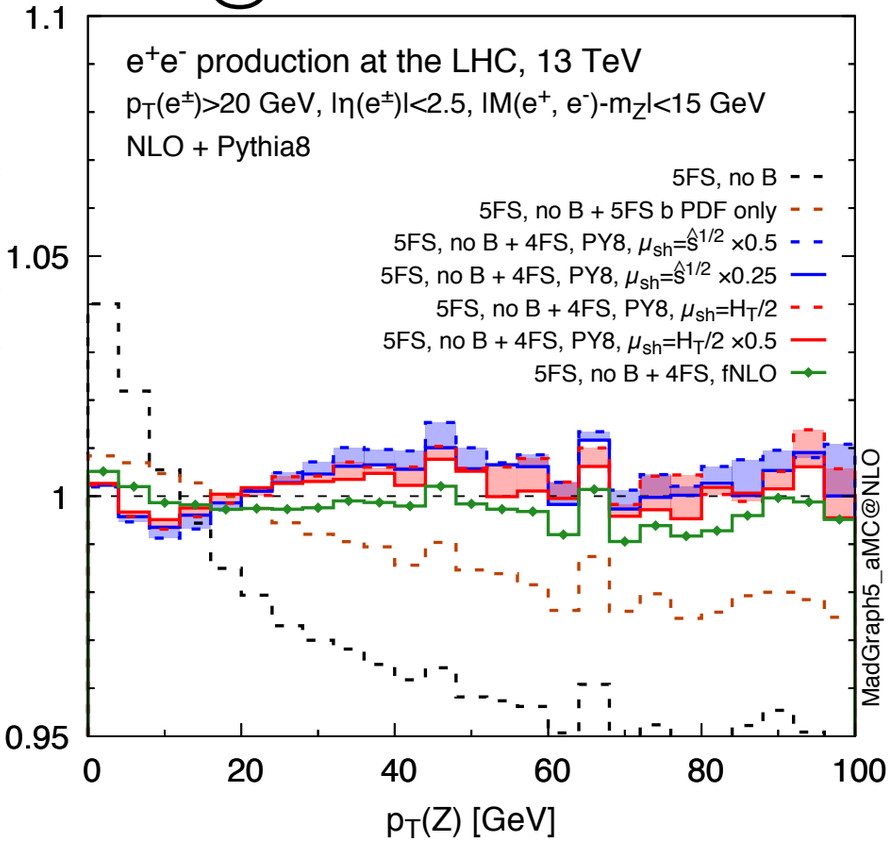
Improved prediction of the ptZ distribution

$$\mathcal{R}(p_{\perp}^{l^+l^-}) = \left(\frac{1}{\sigma_{fid}^{best}} \frac{d\sigma^{best}}{dp_{\perp}^{l^+l^-}} \right) \cdot \left(\frac{1}{\sigma_{fid}^{5FS}} \frac{d\sigma^{5FS}}{dp_{\perp}^{l^+l^-}} \right)^{-1}$$

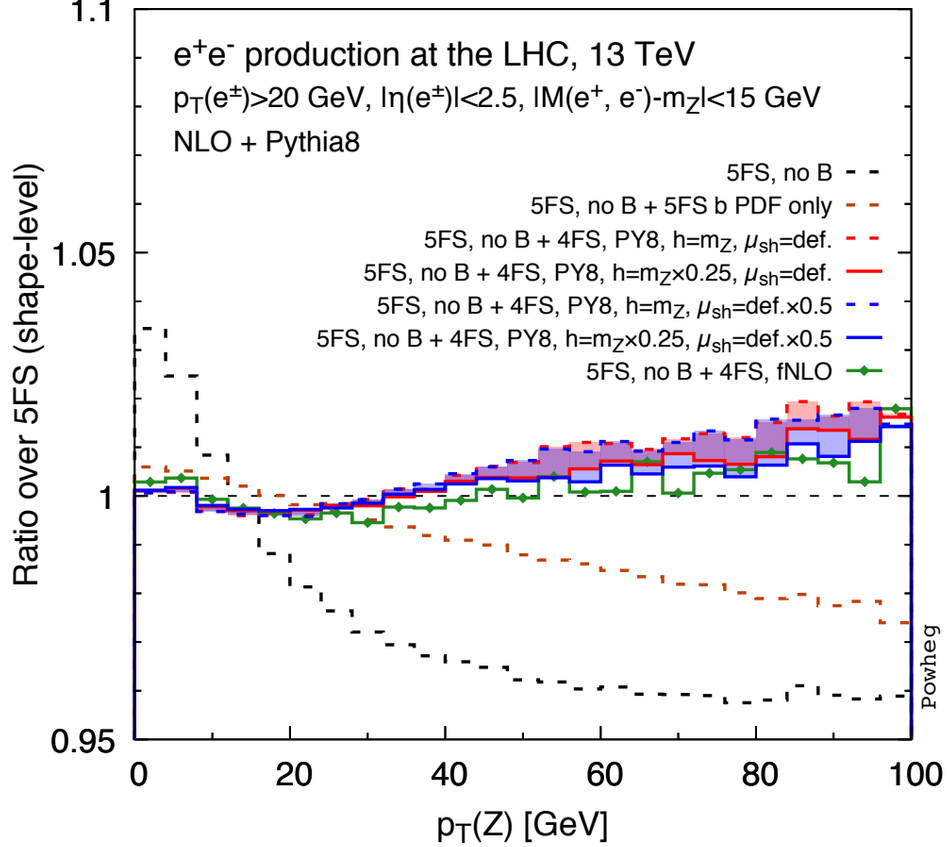
- $\mathscr{R}$ expresses the distortion of the improved ptZ, with respect to the full plain 5FS prediction

- for a given B-veto distribution the 4FS part is added in different approximations of Shower scale (aMC@NLO) or damping factor scale (POWHEG)
- $\mathscr{R}$ is computed for a given PS tune

aMC@NLO



POWHEG



- distortion with a non trivial shape for ptZ<50 GeV
- in aMC@NLO effects at the ±1% level, in POWHEG effects at the ±0.5% level