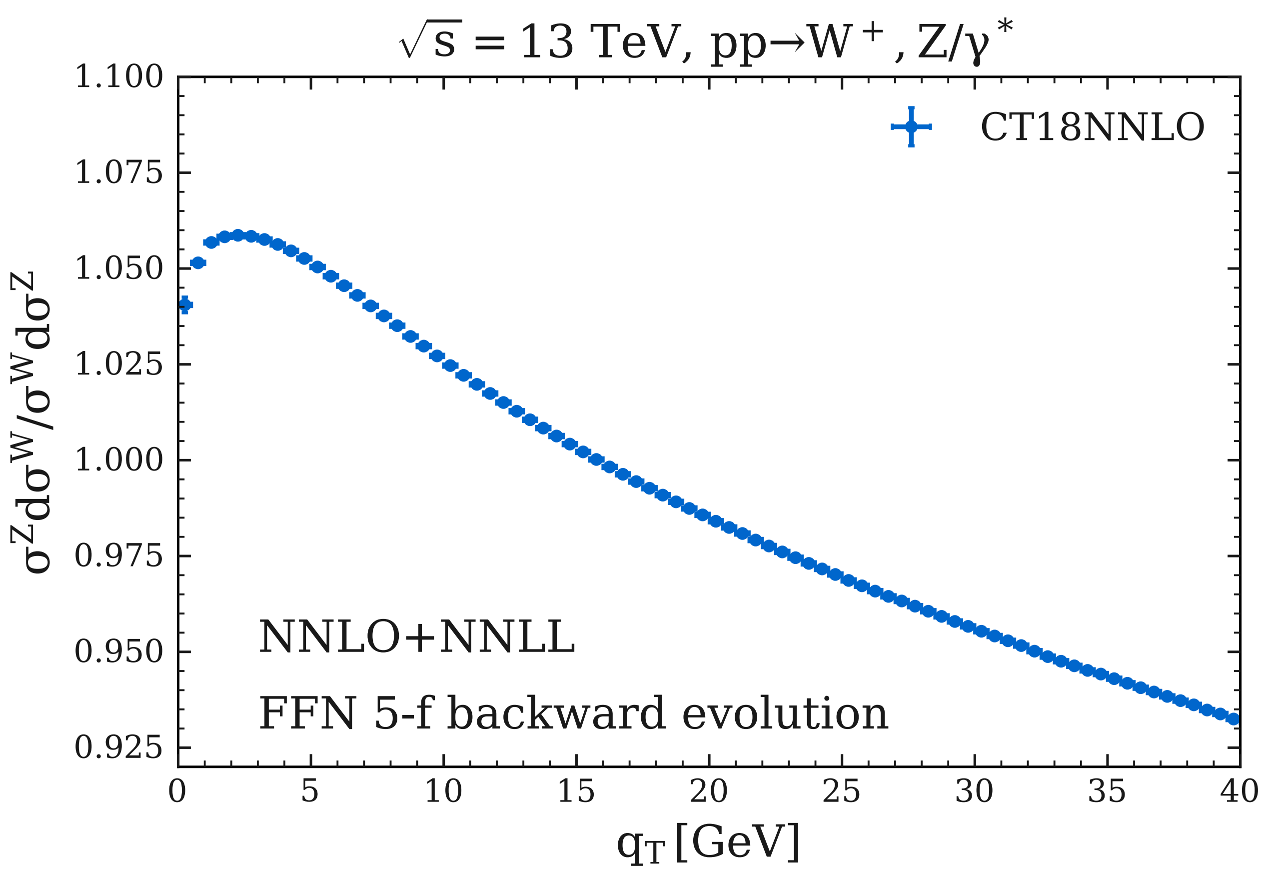
QCD modelling

Studies of p_T^W / p_T^Z

- A precise prediction of the ratio of *W*- and *Z*-p_T distributions, together with the measurement of *Z* p_T, gives stringent constraints on the *W*-p_T spectrum.



- Since *Z* p_T is very well measured, the relevant theoretical uncertainties come from W/Z p_T modelling:
  - choice of PDF evolution
  - description of heavy-flavour-initiated (HFI) production → harder boson p_T
  - effect of non-perturbative parameters (i.e. g_1) variations.

QCD modelling

QCD fits of low-mass Drell-Yan data

- $pp \to \gamma^*/Z \to \mu\mu$ measurement at $\sqrt{s} = 13$ TeV gives unique access to QCD non-perturbative regime.
- $p_{\mathrm{T}}^{\mu\mu}$ measured in 7 invariant mass bins in $12 < m_{\mu\mu} < 56$ GeV.
- Use xFitter + DYTurbo to fit the data and extract non-perturbative QCD parameters

Non perturbative QCD model

- NP model is generally determined from the data, parameters values depend on the chosen prescription to avoid the Landau pole in b-space

$$b_\star = \frac{b}{1 + b^2/b_{\mathrm{lim}}^2}$$

$$S_{\mathrm{NP}}(b) = \exp\left[-g_j(b) - g_K(b)\log\frac{m_{\ell\ell}^2}{Q_0^2}\right] \quad \begin{cases} g_j(b) = \frac{g\,b^2}{\sqrt{1+\lambda b^2}} + \mathrm{sign}(q)\left(1-\exp\left[-|q|\,b^4\right]\right) \\ g_K(b) = g_0\left(1-\exp\left[-\frac{C_F\alpha_s(b_0/b_*)b^2}{\pi g_0 b_{\mathrm{lim}}^2}\right]\right) \end{cases}$$

- g_j functions include a quadratic and a quartic term, with g and q free parameters of the fit