Estimate of the uncertainties

$$\frac{d\sigma}{dq_T} \propto H(M_{\ell\ell}, \mu_R) \quad : \text{Hard factor}$$

$$\times \exp\left[S_{\text{PT}+\text{NP}}(\mu_R, \mu_b)\right] \quad : \text{Evolution}$$

$$\times C_{1,2}(\mu_b) f_{\text{NP}}^{(1,2)}(\mu_b) \quad : \text{Matching onto collinear}$$

$$\times \underbrace{\Gamma_{1,2}^{\text{DGLAP}}(\mu_b, \mu_F) f_1(\mu_F) f_2(\mu_F)}_{f_1(\mu_b) f_2(\mu_b)} \quad : \text{Collinear PDFs}$$

- Theoretical uncertainty estimate on **N³LL**:
  - variations of μ_R by a factor 2 up and down w.r.t. M_{ll},
  - variations of μ_F by a factor 2 up and down w.r.t. M_{ll},
  - estimate of the of the subleading logarithmic corrections by including N⁴LL corrections in the Sudakov (mimicking **resummation scale variations**),
    [G. Das, S.-O. Moch, A. Vogt, arXiv:1912.12920]
  - inclusion of non-perturbative effects as determined in the **PV19** fit.
    [A. Bacchetta *et al.*, arXiv:1912.07550]

Estimate of the uncertainties

- N^4LL corrections to the Sudakov: [G. Das, S.-O. Moch, A. Vogt, arXiv:1912.12920]

$$A_5 = (1.7 \pm 0.5\,,\ 1.1 \pm 0.5\,,\ 0.7 \pm 0.5) \cdot 10^5 \quad \text{for} \quad n_f = 3\,,\ 4\,,\ 5\,.$$

$$B_4^{\rm DIS}\Big|_{\rm appr} = (10.68 \pm 0.01) \cdot 10^4 + (-2.025 \pm 0.032) \cdot 10^4\, n_f + 798.0698\, n_f^2 - 12.08488\, n_f^3$$

  - we used the configuration that gave the largest difference w.r.t. N^3LL (and finally multiplied it by two both in the plus and minus directions).

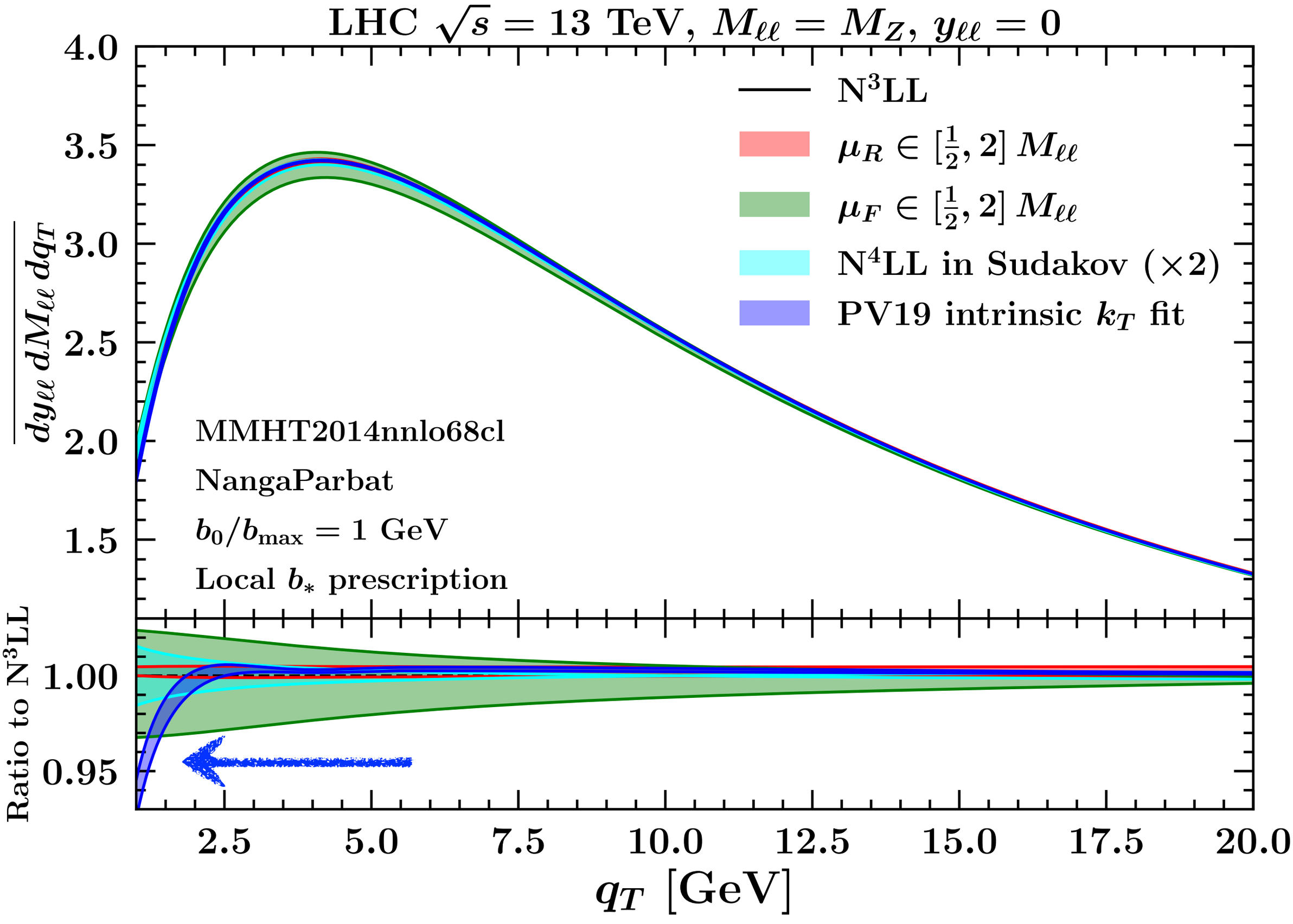
- **Non-perturbative corrections** determined by a fit to data at N^3LL (PV19): [A. Bacchetta *et al.*, arXiv:1912.07550]

  - Parameterisation used:

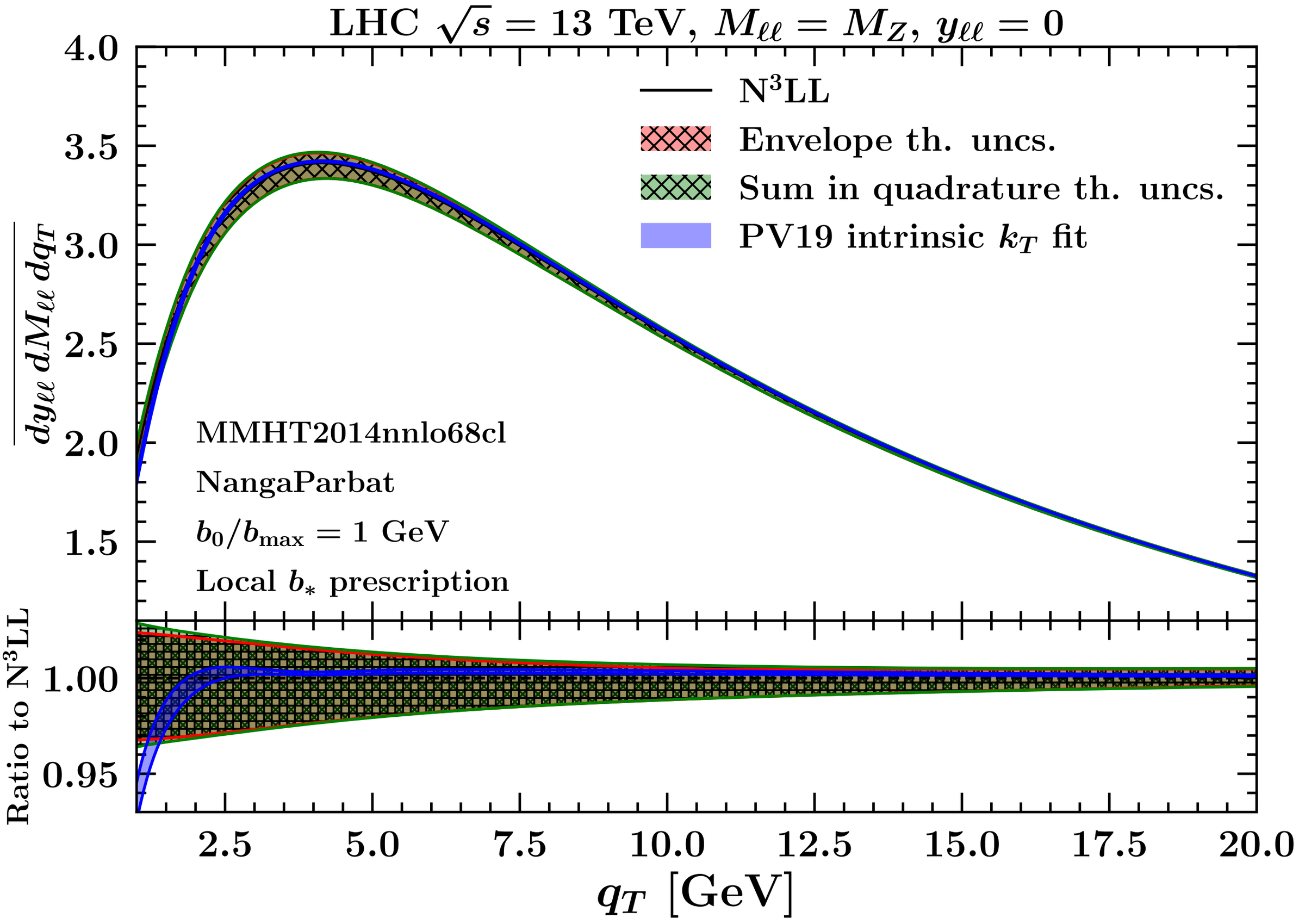
$$f_{\rm NP}(x,\mu_b)\exp\left[S_{\rm NP}(Q,\mu_b)\right] = \left[\frac{1-\lambda}{1+g_1(x)\frac{b^2}{4}} + \lambda \exp\left(-g_{1B}(x)\frac{b^2}{4}\right)\right] \times \exp\left[-\left(g_2 + g_{2B}b^2\right)\ln\left(\frac{Q^2}{Q_0^2}\right)\frac{b^2}{4}\right]$$

$$g_1(x) = \frac{N_1}{x\sigma}\exp\left[-\frac{1}{2\sigma^2}\ln^2\left(\frac{x}{\alpha}\right)\right] \qquad g_{1B}(x) = \frac{N_{1B}}{x\sigma_B}\exp\left[-\frac{1}{2\sigma_B^2}\ln^2\left(\frac{x}{\alpha_B}\right)\right]$$

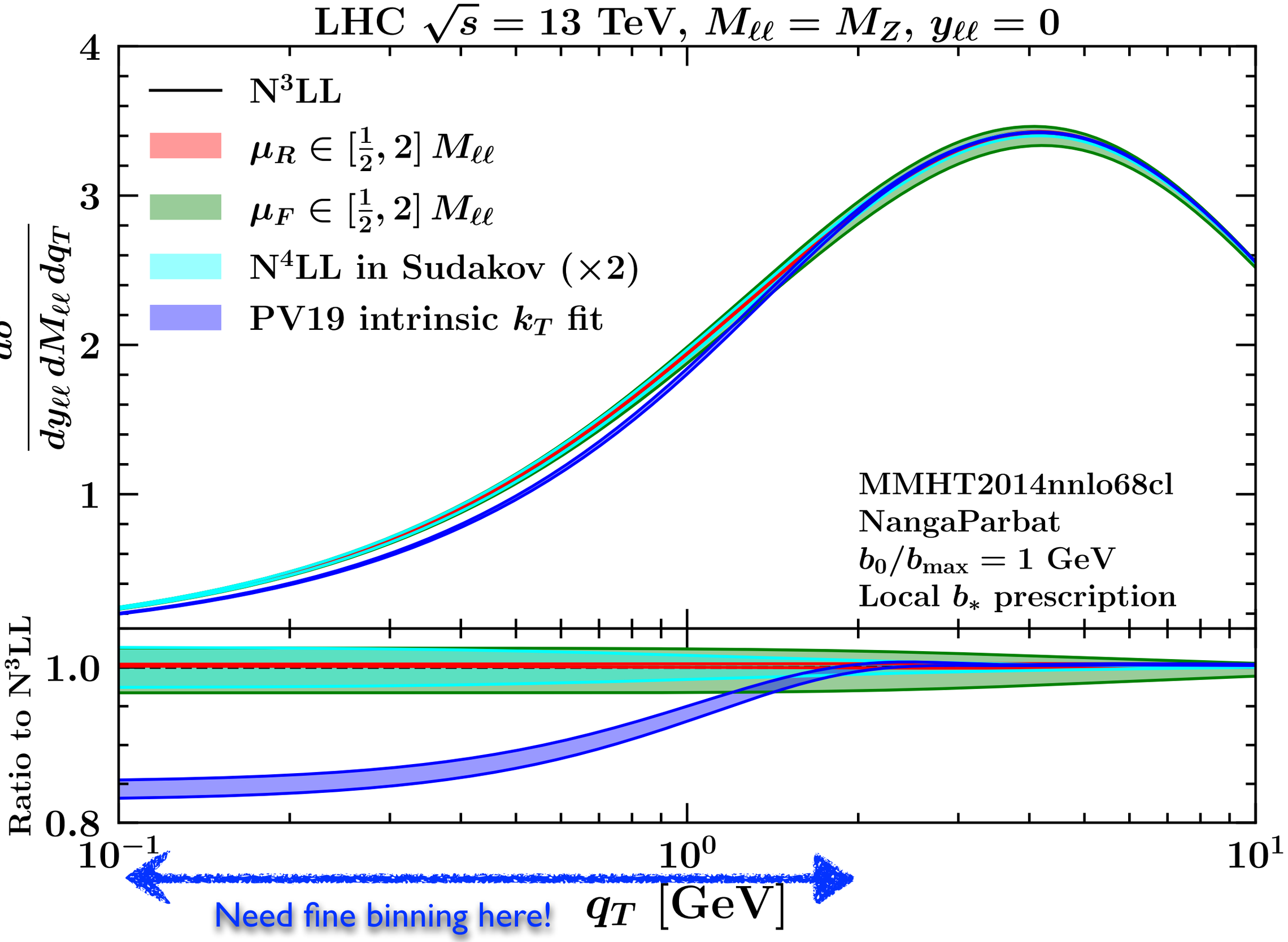
Estimate of the uncertainties



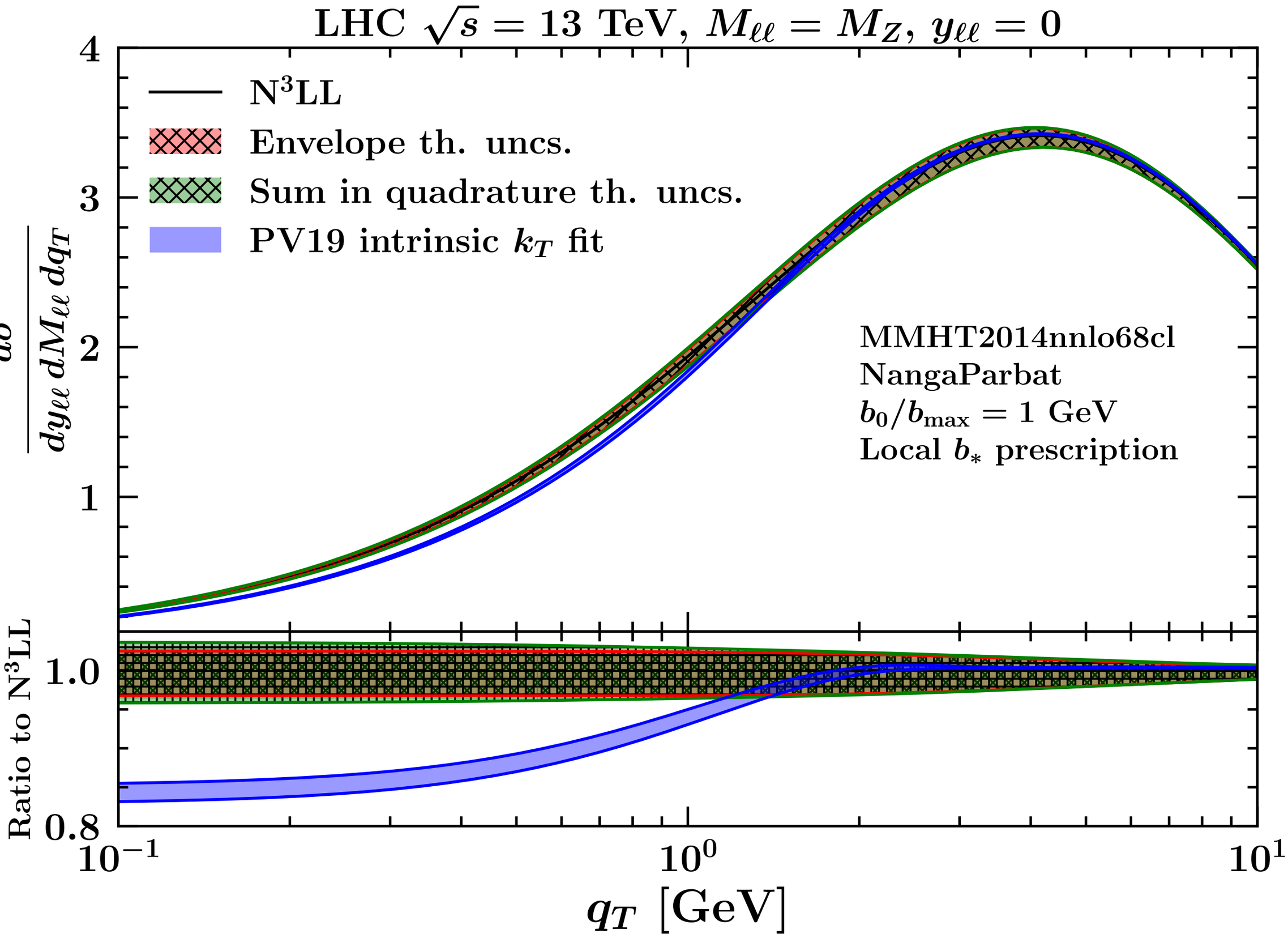
Estimate of the uncertainties



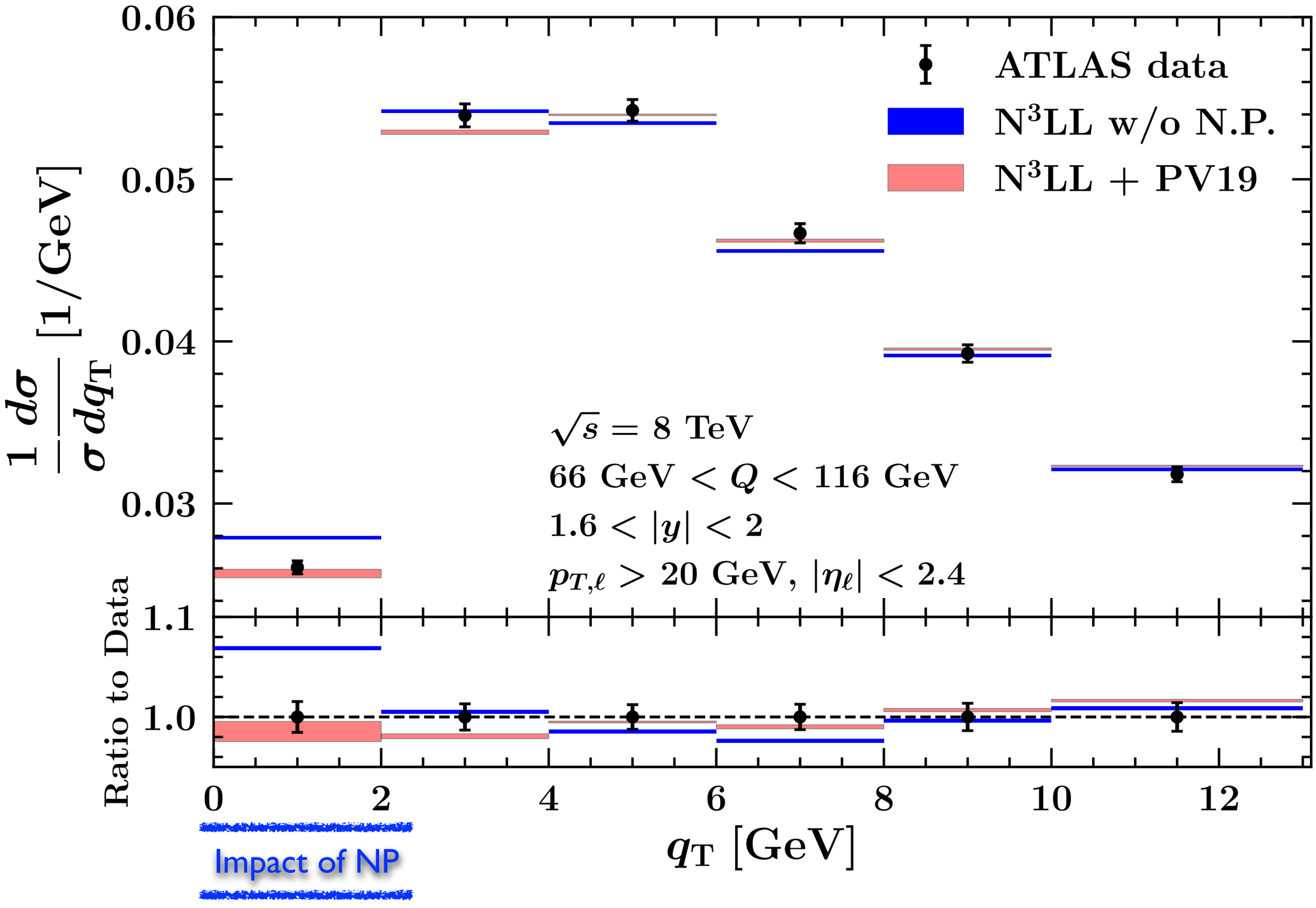
Estimate of the uncertainties



Estimate of the uncertainties



Estimate of the uncertainties



Impact of NP

Moving to level 3 (very preliminary)