Error analysis of the Higgs transverse spectrum

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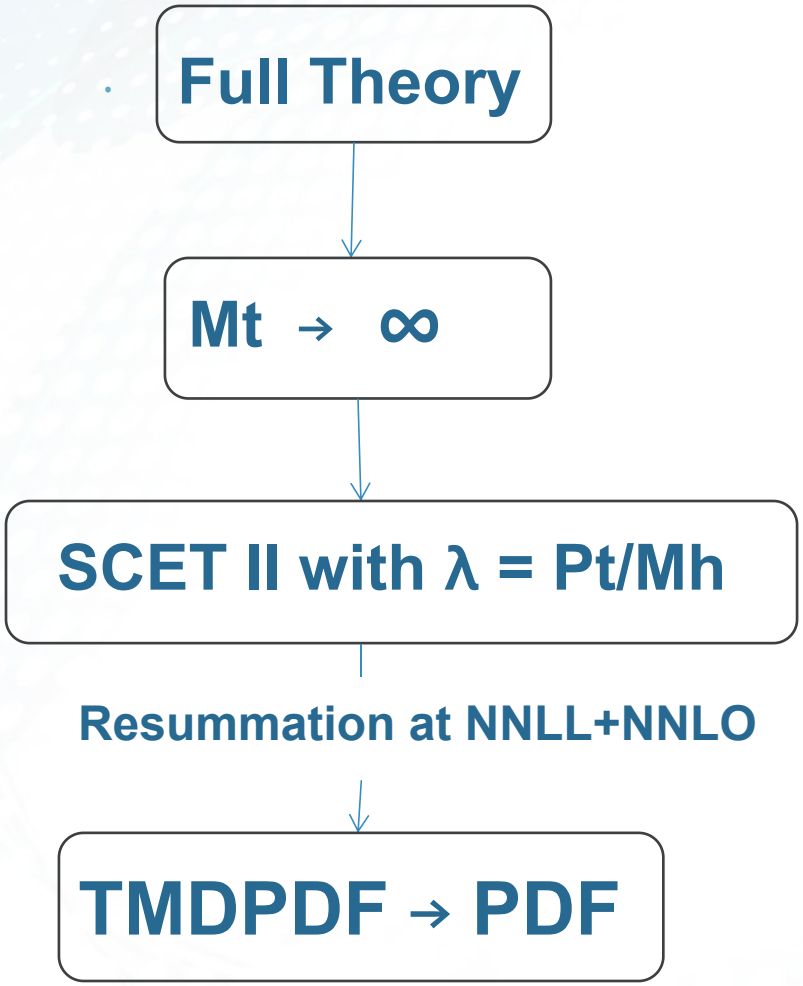
Higgs transverse spectrum



Mt

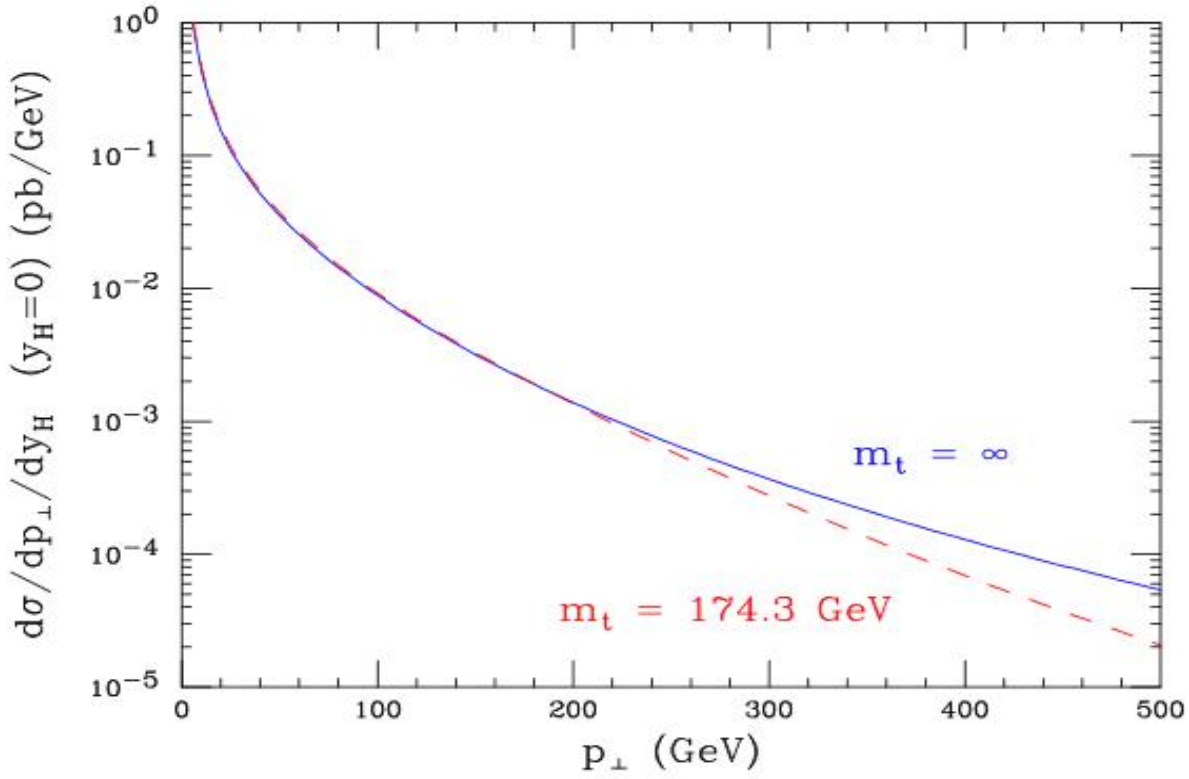
Mh power corrections in Mh/Mt

Pt power corrections in Pt/Mh

N^3LL + higher order corrections

Λ_{QCD} power corrections in Λ_{QCD}/Pt

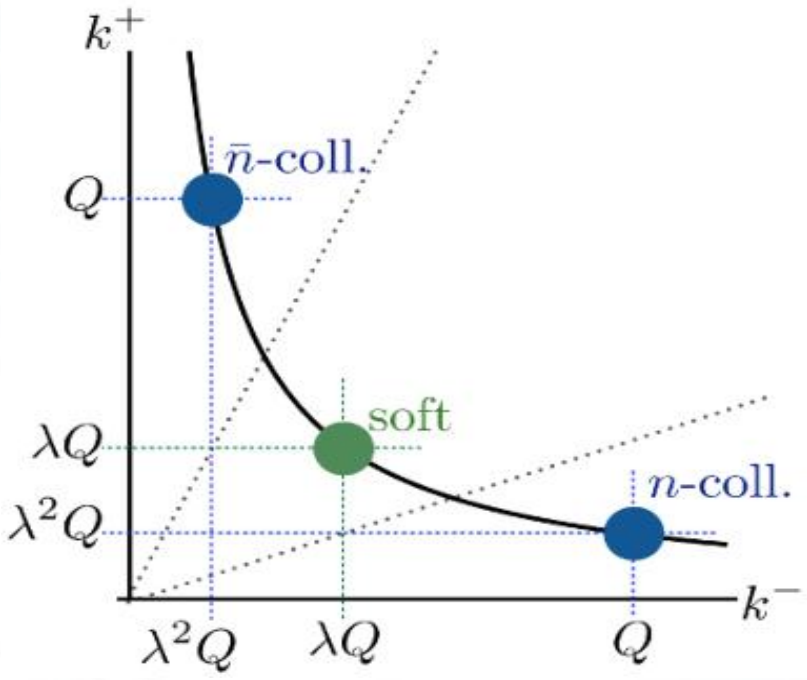
Power corrections in Mh/Mt



- Corrections relevant only for Pt > Mh

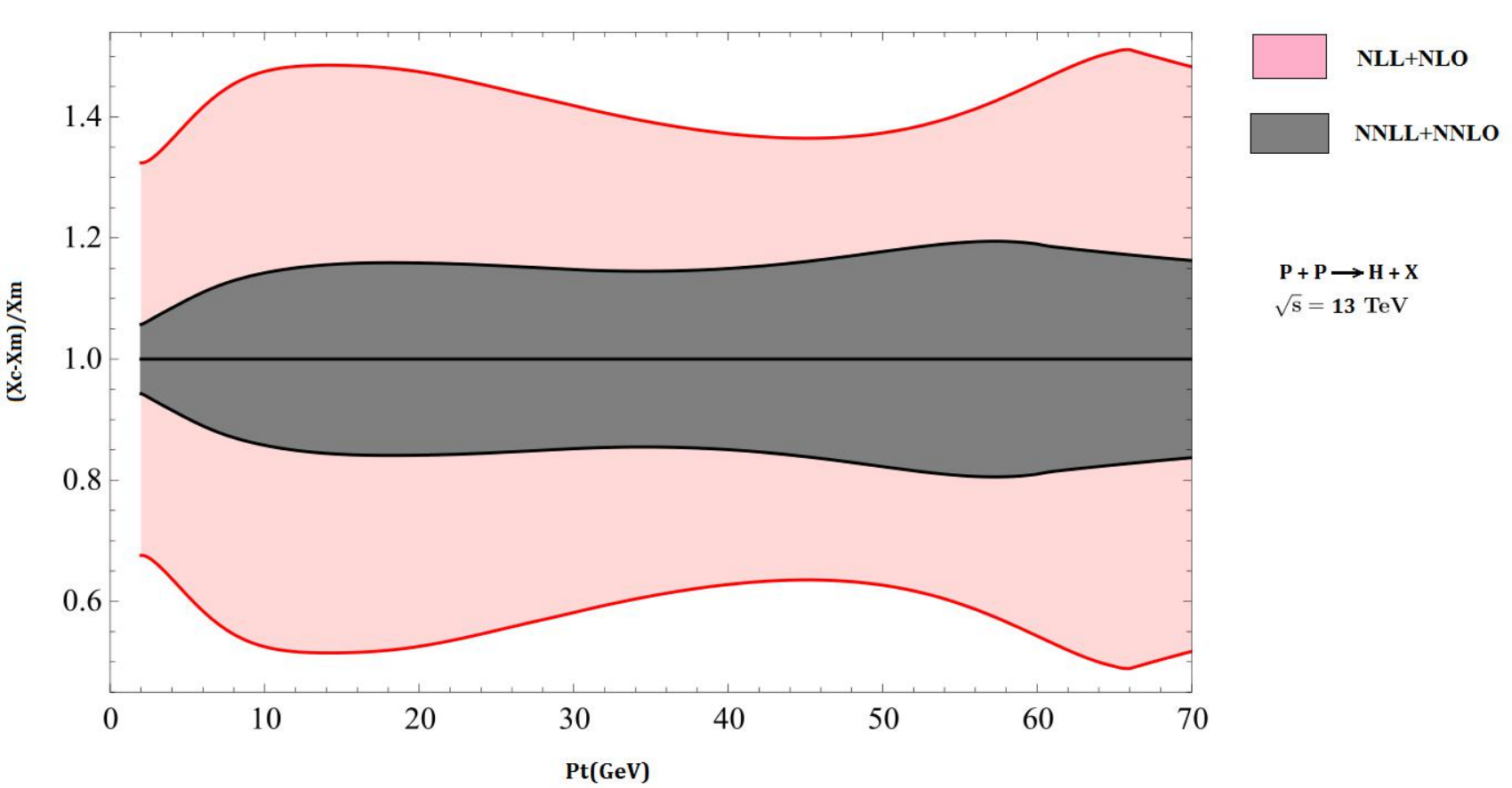
Renormalization scale variation

$$\frac{d^2\sigma}{dP_t^2 dy} \sim H(M_h) C_t^2 \int dbbJ_0(bP_t) \left[f_n^{\mu\nu}(b, z_1) f_{\mu\nu,\bar{n}}(b, z_2) S(b) \right]$$



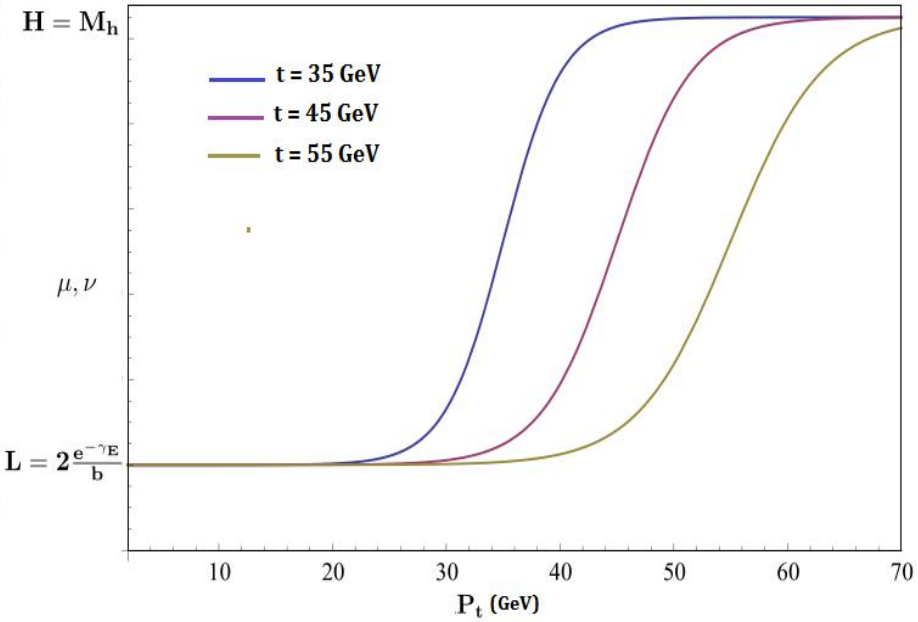
- Two independent scale variations : The virtuality scale : μ, the rapidity scale : ν

Scale variation error band



Power corrections in Pt/Mh

- Non-singular pieces ~ Pt/Mh become comparable to the singular cross section at Pt ~ 30 GeV
- Logs are small and resummation is not required.



- Turn off resummation using profiles in μ,ν
- Match to the full theory **NNLO** ($O(\alpha_s^2)$) cross section

Power corrections in ΛQCD/Pt

- Power corrections in ΛQCD/Pt are important at very low values of Pt.
- Include higher dimensional operators in both the soft and colinear sectors.

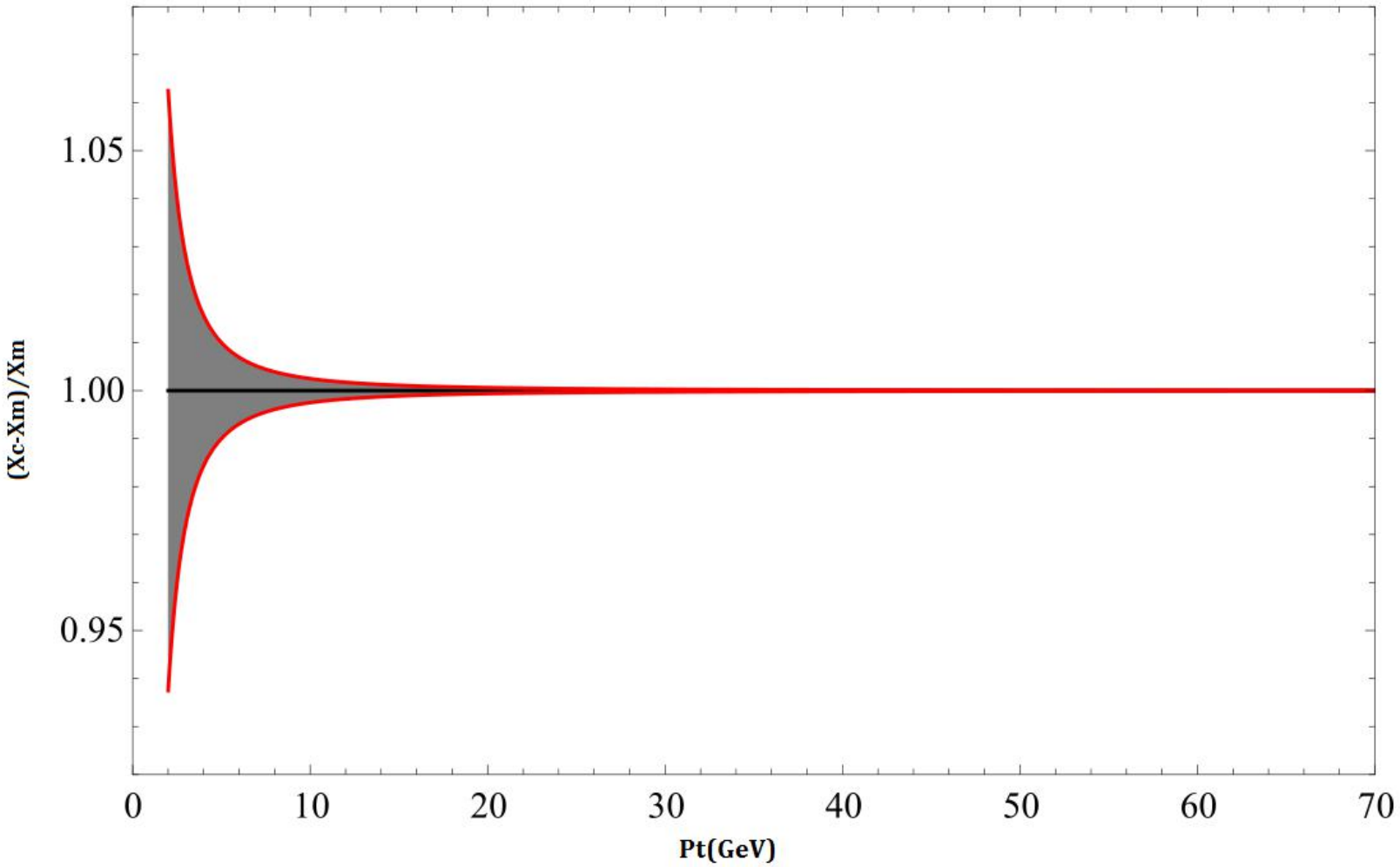
$$S_n^{ac}(0)S_{\bar{n}}^{ad}(0)\mathcal{P}_\perp^\alpha\mathcal{P}_\perp^\beta S_n^{bc}(0)S_{\bar{n}}^{bd}(0)$$

$$\left\{B_{n\perp}^{A\mu}(0)\delta(p_n z_1-\overline{\mathcal{P}}_n)\mathcal{P}_\perp^\sigma\mathcal{P}_\perp^\rho\left[B_{n\perp}^{A\nu}(0)\right]\right\}$$

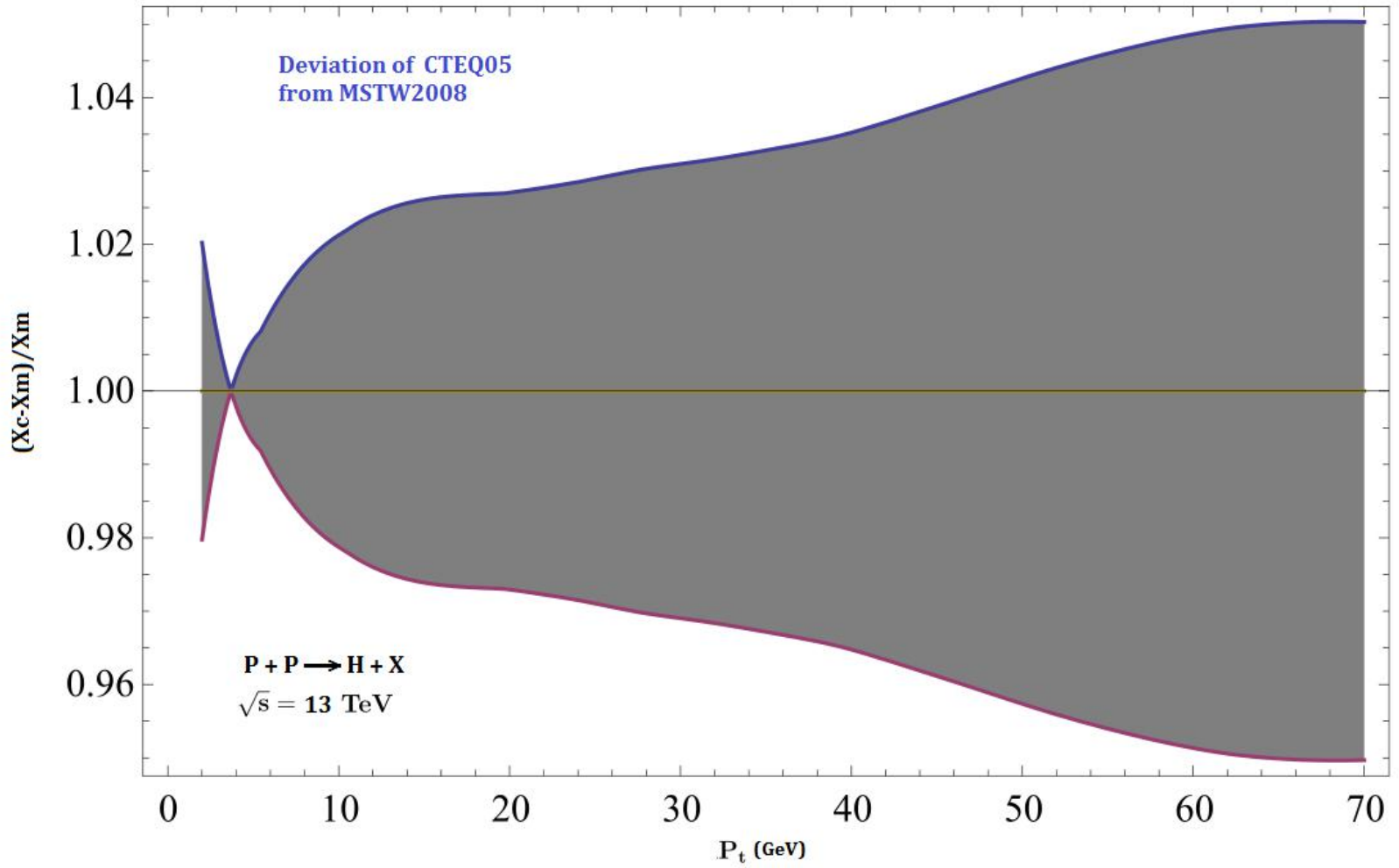
- An estimate of these power corrections

$$\frac{d\sigma}{dP_t}\left(1\pm\frac{\Lambda_{QCD}^2}{P_t^2}\right)$$

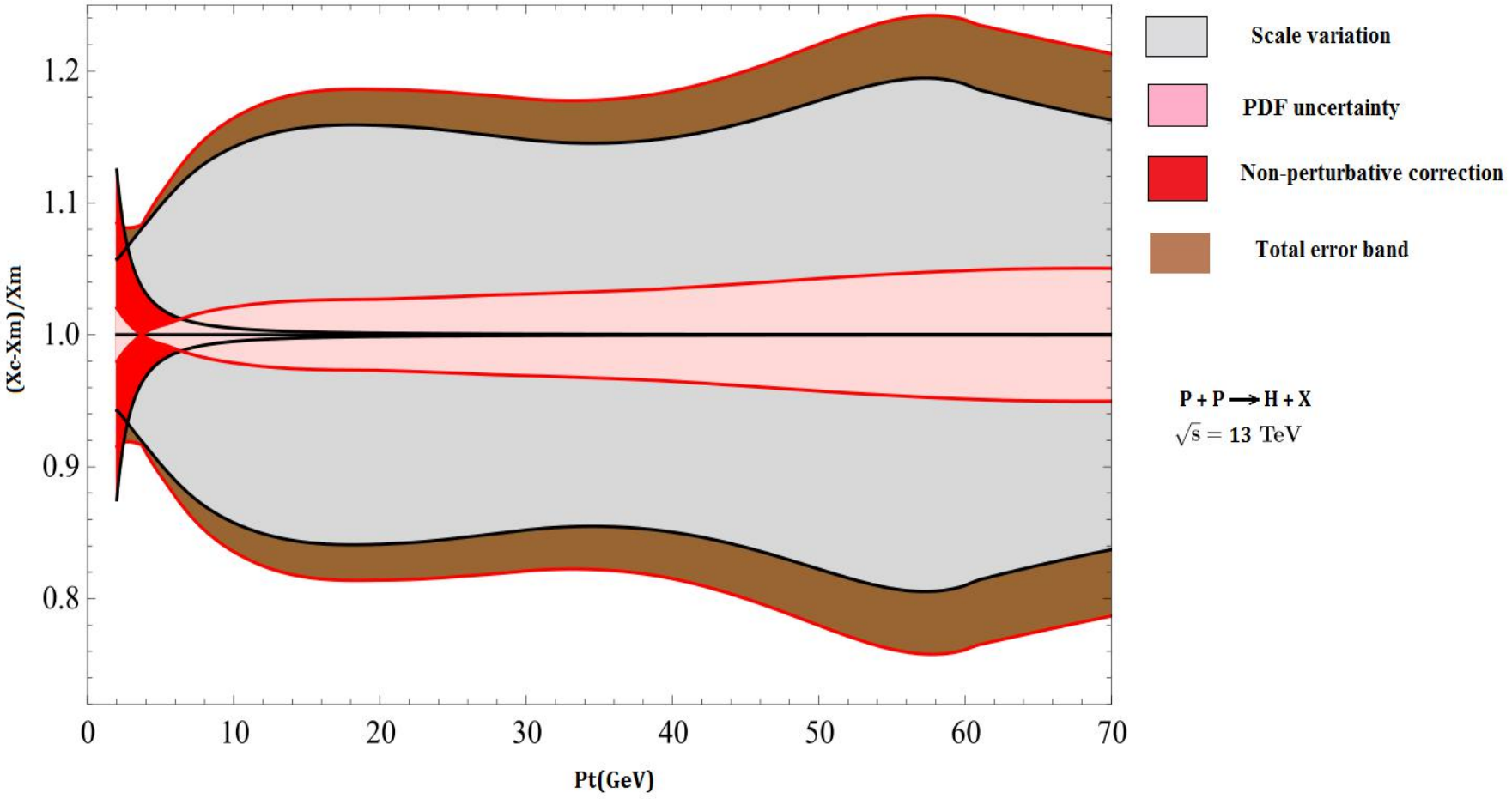
Non-perturbative corrections

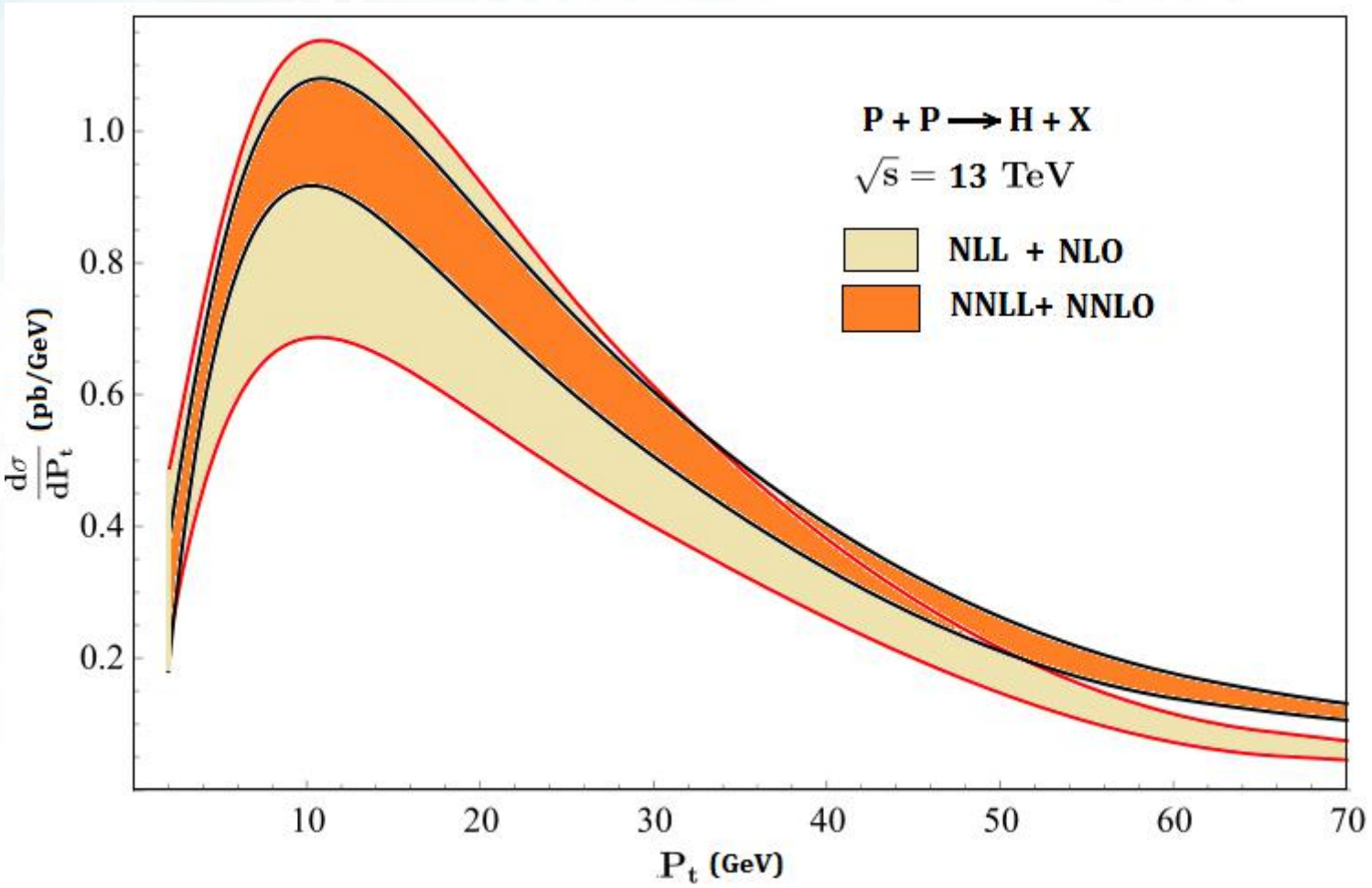


PDF uncertainty



Total Error Band





- Two independent scale variations provide a more reliable error estimate

Conclusion

- Scale variation is dominant source of uncertainty

  ν variation enhances error band

- Power corrections in Mh/Mt important for Pt > Mh
- Non perturbative power corrections important for Pt< 5 GeV

  Power suppresed operators need to be included

  Extraction of TMDPDF from expt. for Pt < 1 GeV