DESY 25-XXX October 2025

Toponium: parametric uncertainties

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Abstract

We quantify the effect of various parametric uncertainties on toponium production.

I. PLOTS

A. PDF variation

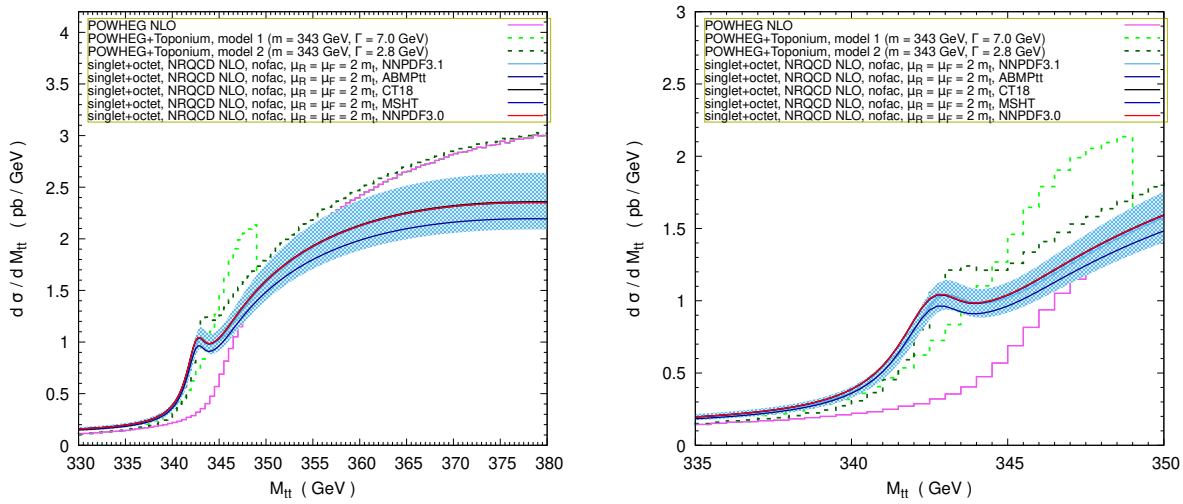

FIG. 1: Left: predictions using various central PDF sets, using as central scale $\mu_r = \mu_F = 2m_t$ compared with modelization provided by the CMS experimentalists. Scale uncertainties (light-blue) refer to our default configuration with NNPDF3.1. Predictions with NNPDF3.0, CT18 and MSHT20 almost overlap [Is this overlap expected and meaningful?]. Right: zoom of the same plot in the threshold region. [Matthias and Giovanni: can you please run NNPDF4.0 instead of NNPDF3.0 ? This will help me to check the question above.] [Matthias and Giovanni: with which values of mt and alphaS(mz) did you run ABMPtt ? Do you know that one should run it with an m_t value that is NOT 172.5 GeV and an $\alpha_s(M_Z)$ value that is NOT 0.118 ?] [Sven: can you ask ABMPtt with 0.118 to Sergey ?]

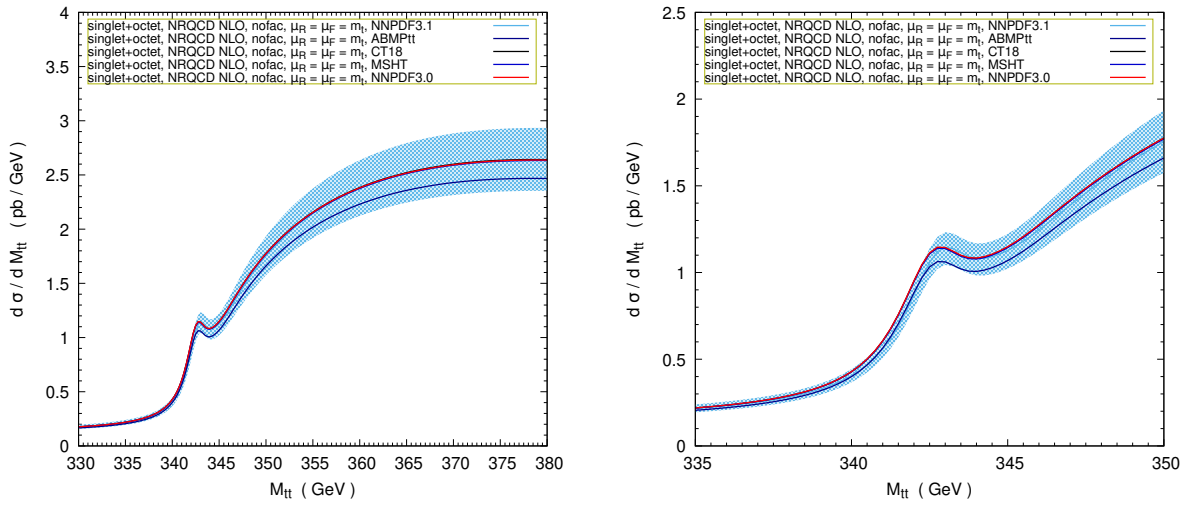

FIG. 2: Left: predictions using various central PDF sets, using as central scale $\mu_r = \mu_F = m_t$. Scale uncertainties (light-blue) refer to our default configuration with NNPDF3.1. Right: zoom of the same plot in the threshold region.

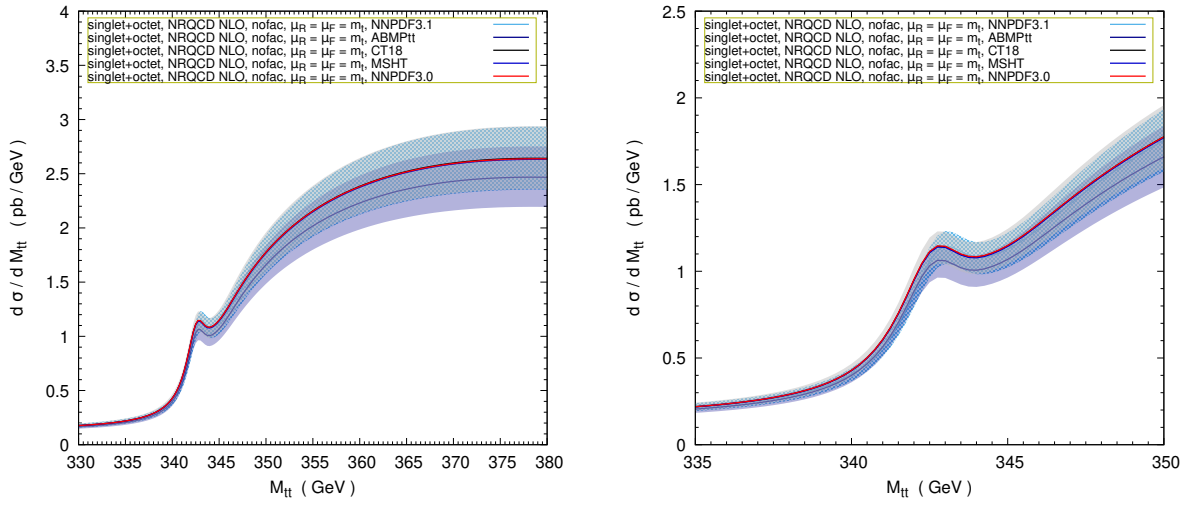

FIG. 3: Left: predictions using various central PDF sets, using as central scale $\mu_r = \mu_F = m_t$. Scale uncertainties for predictions with the NNPDF3.1 (light-blue), CT18 (gray) and ABMP16 (violet-blue) sets are also reported. Right: zoom of the same plot in the threshold region.

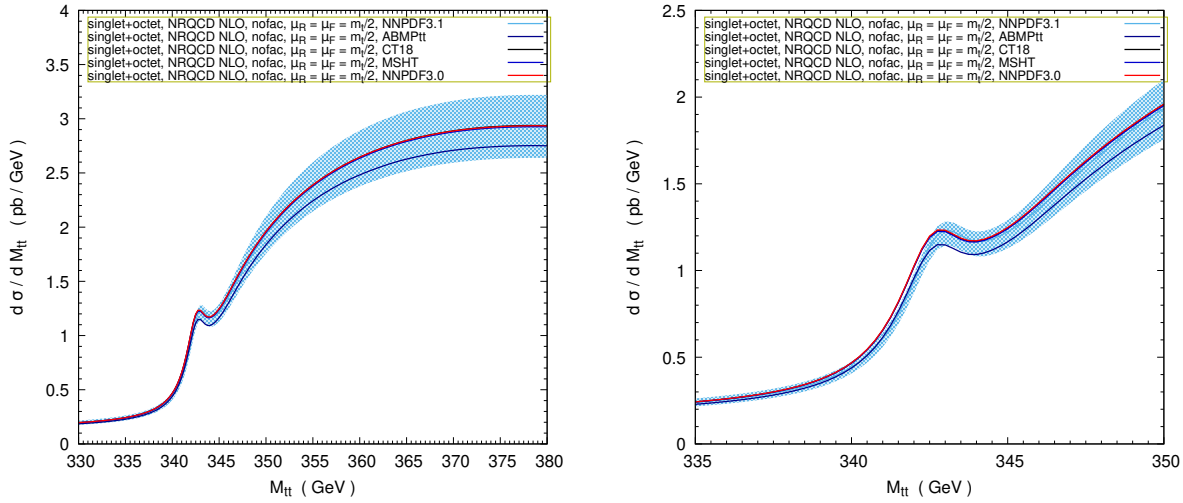

FIG. 4: Same as Fig. 2, but for $\mu_R = \mu_F = m_t/2$ central scale.

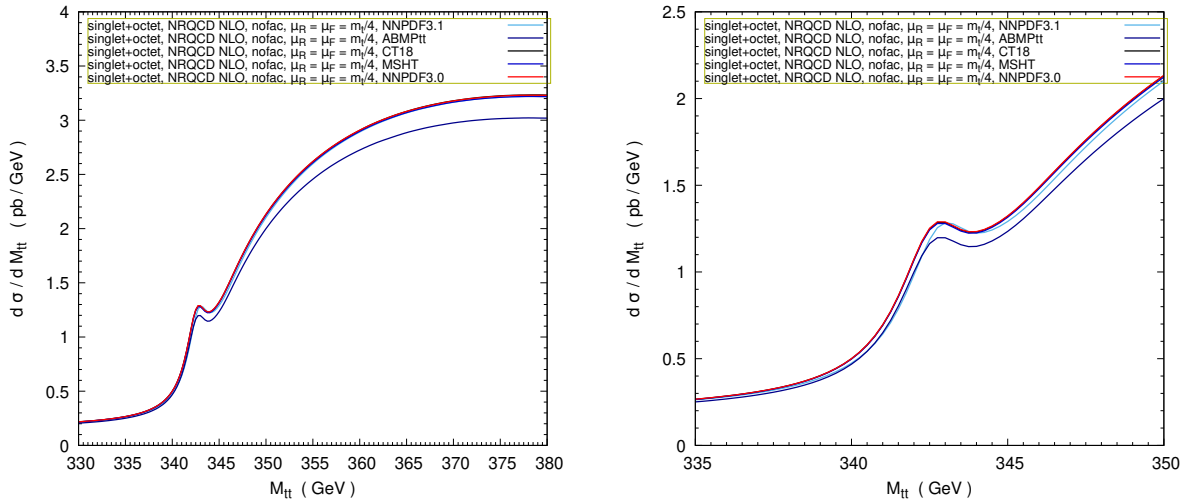

FIG. 5: Same as Fig. 2, but for $\mu_R = \mu_F = m_t/4$ central scale, and without scale uncertainty bands.

B. Strong coupling variation

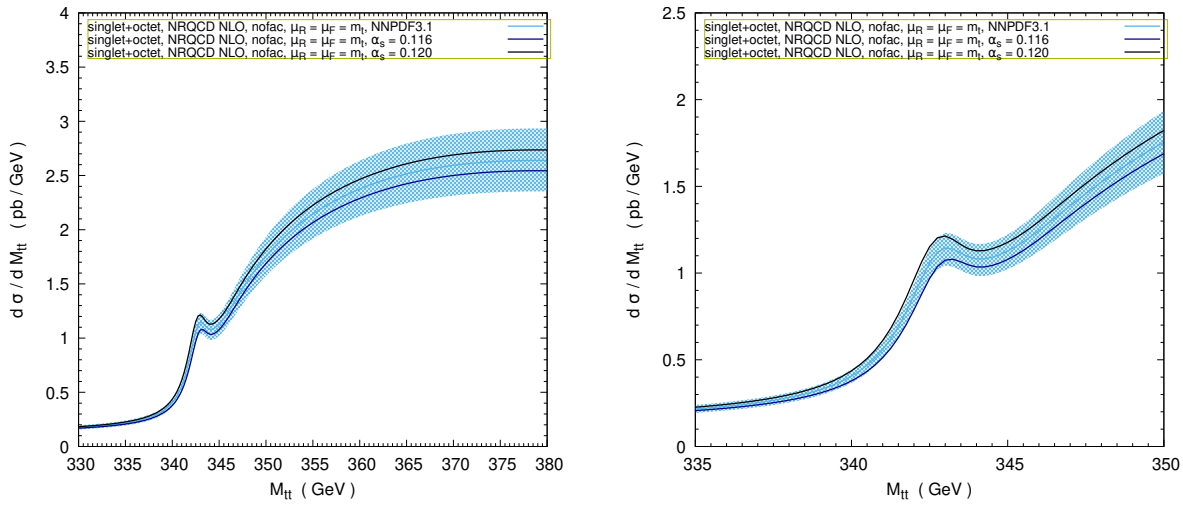

FIG. 6: Left: predictions using as input central scale $\mu_r = \mu_F = m_t$ and NNPDF3.1 PDF with its associated default $\alpha_s(M_Z)$ value, equal to 0.118 compared to those with $\alpha_s(M_Z) = 0.116$ and $\alpha_s(M_Z) = 0.118$. Scale uncertainties (light-blue) refer to our default configuration. Right: zoom of the same plot in the threshold region.

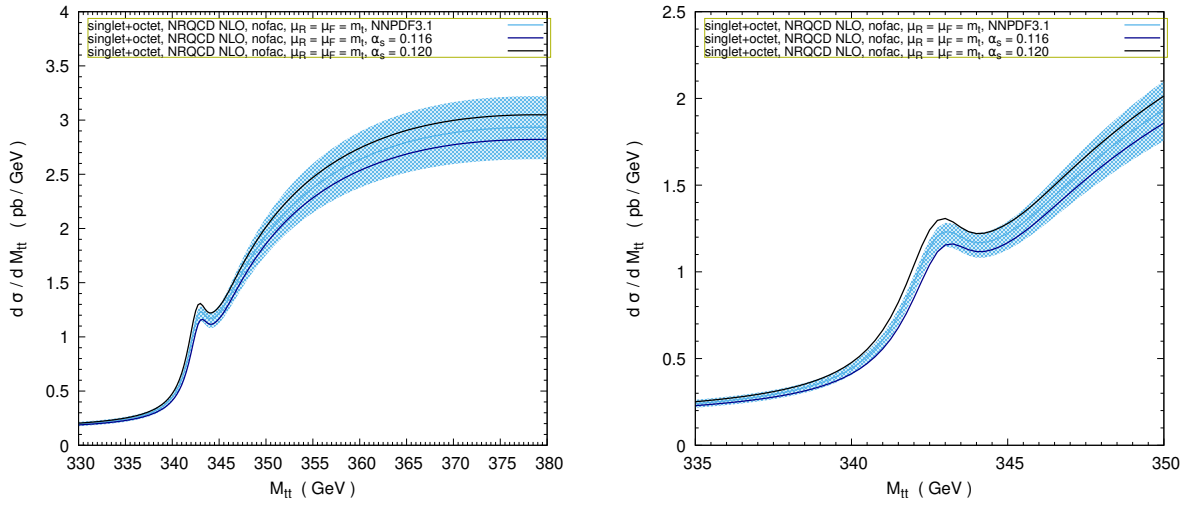

FIG. 7: Same as Fig. 6, but for a central scale $\mu_r = \mu_F = m_t/2$.

C. Top-quark width variation

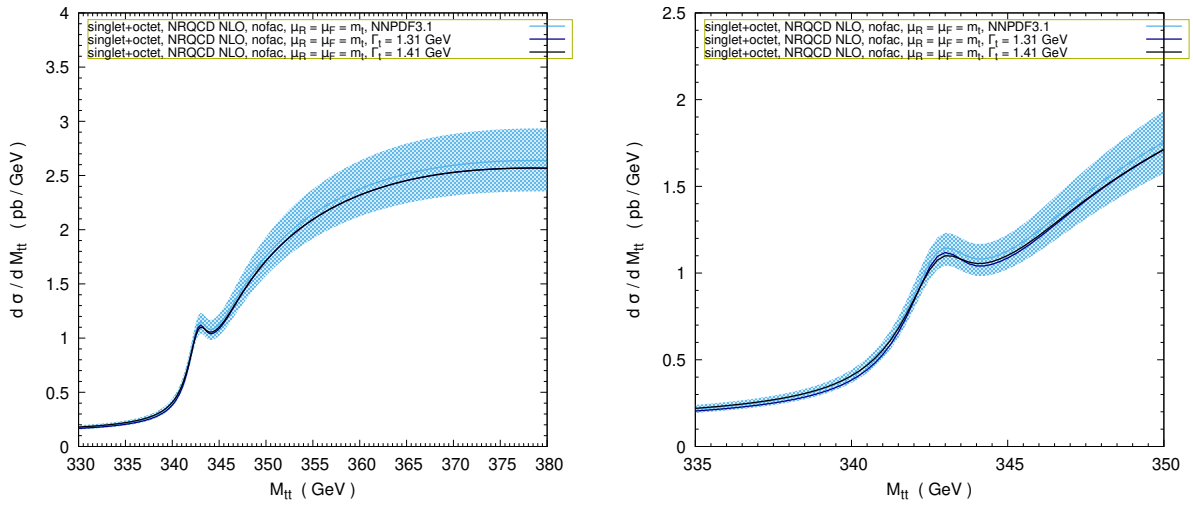

FIG. 8: Left: predictions using as input central scale $\mu_r = \mu_F = m_t$ and NNPDF3.1 PDF with its associated default $\alpha_s(M_Z)$ value and $\Gamma_t = 1.XX$ GeV [What is our default Γ_t ?] compared to those with $\Gamma_t = 1.31$ GeV and $\Gamma_t = 1.41$ GeV. Scale uncertainties (light-blue) refer to our default configuration. Right: zoom of the same plot in the threshold region. [These predictions are probably wrong, they do not refer to the "no fac" configuration. Please Matthias recheck.]

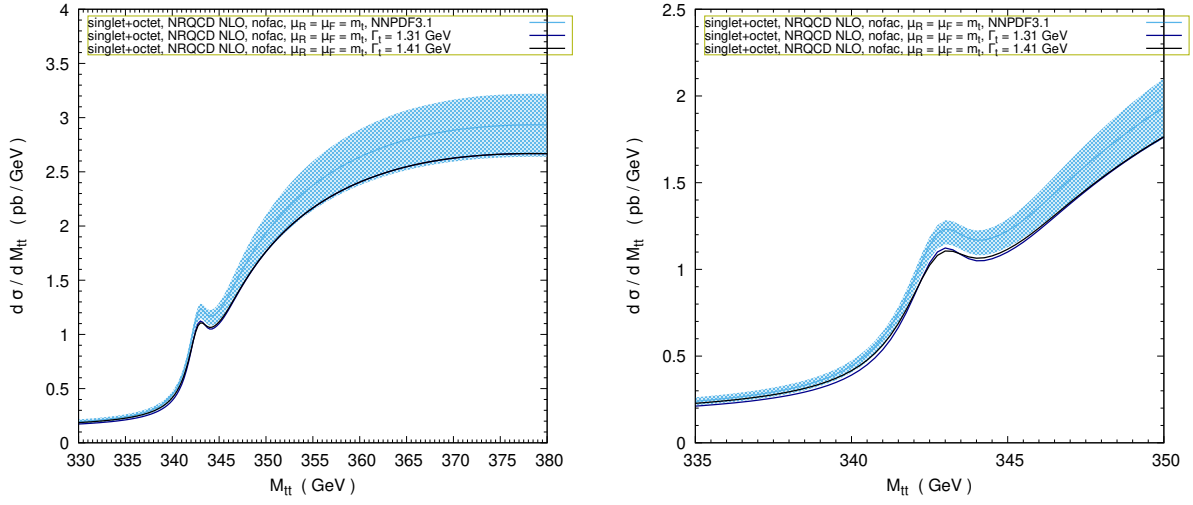

FIG. 9: Same as Fig. 8, but for a central scale $\mu_r = \mu_F = m_t/2$. [These predictions are probably wrong, they do not refer to the "no fac" configuration. Please Matthias recheck.]

D. Top-quark mass variation

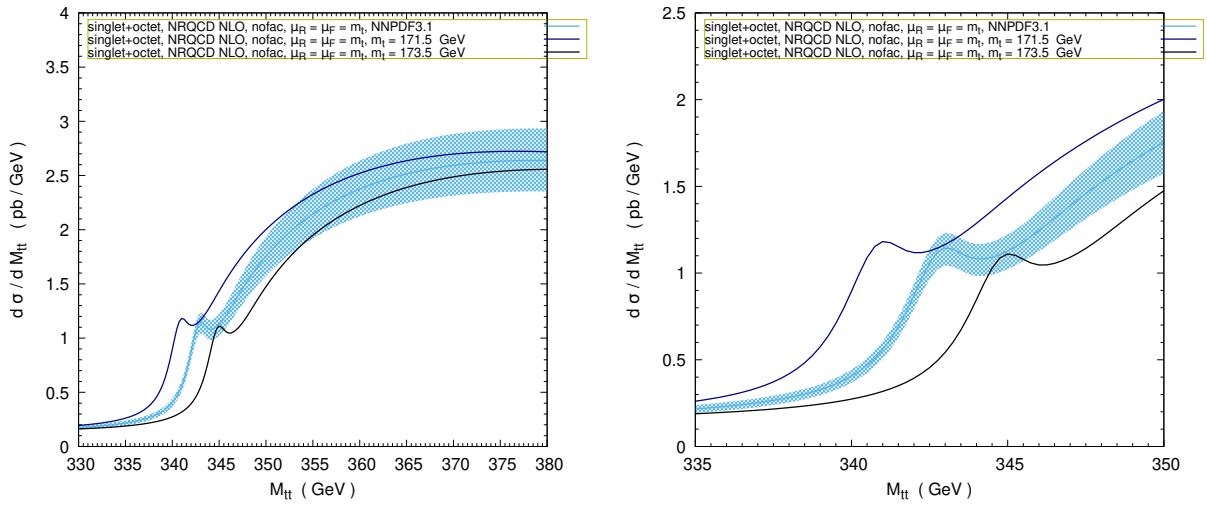

FIG. 10: Left: predictions using as input central scale $\mu_r = \mu_F = m_t$ and NNPDF3.1 PDF with its associated default $\alpha_s(M_Z)$ value and m_t = 172.5 GeV [What is our default m_t ?] compared to those with m_t = 171.5 GeV and m_t = 173.5 GeV. Scale uncertainties (light-blue) refer to our default configuration. Right: zoom of the same plot in the threshold region.

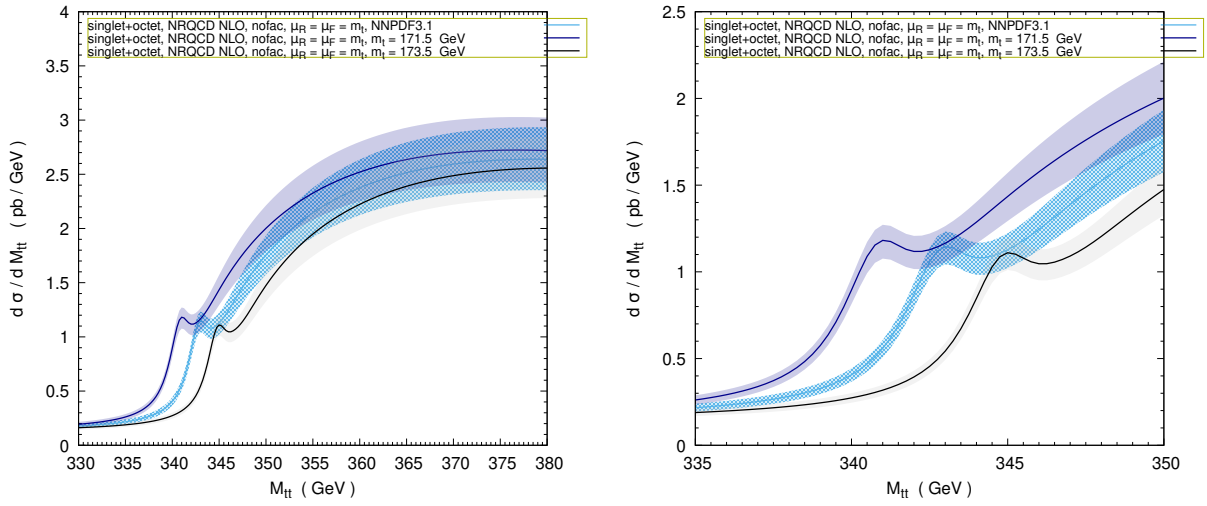

FIG. 11: Left: predictions using as input central scale $\mu_r = \mu_F = m_t$ and NNPDF3.1 PDF with its associated default $\alpha_s(M_Z)$ value and m_t = 172.5 GeV [What is our default m_t ?] compared to those with m_t = 171.5 GeV and m_t = 173.5 GeV. Scale uncertainties (light-blue) for each configuration are reported. Right: zoom of the same plot in the threshold region.