Impact of the scales variation on p_T distributions

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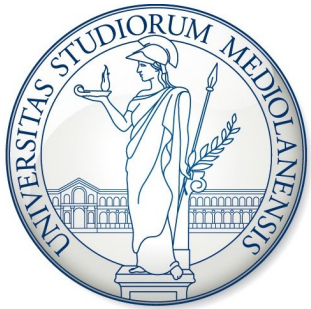

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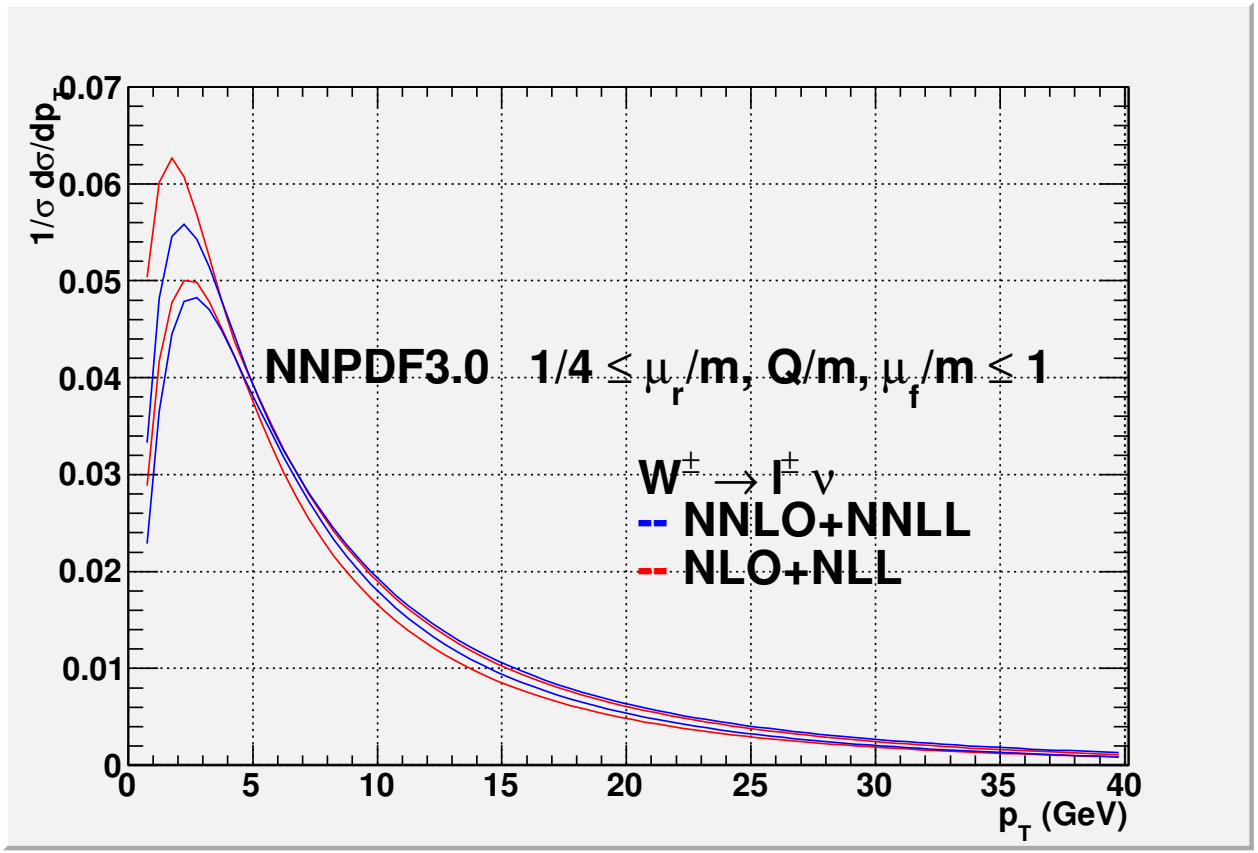
Outline

- Introduction on the scale variation applied;
- Impact on single Z and W production;
- Impact of the scale bands on p_T and ratio distributions;
- Conclusions and further comments;

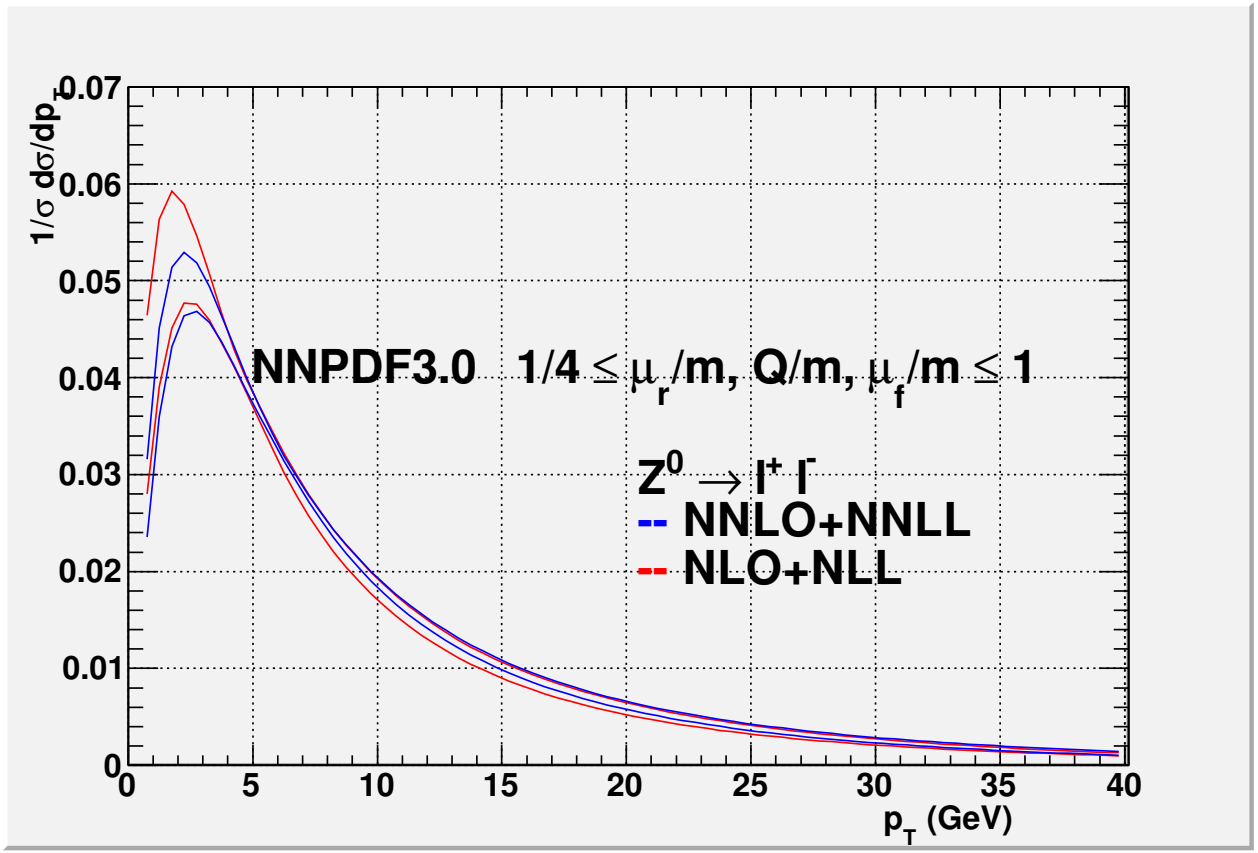
- We use the following scaling of μ_R, μ_F, Q: $1/4 \leq Q/m, \mu_R/m, \mu_F/m \leq 1$;
- Constraints $1/2 < \mu_R/Q, \mu_R/\mu_F < 2 \longrightarrow$ avoid logarithms $\ln(Q/m) = \ln(2), \ln(1/2)$;

- p_T^W **distributions**



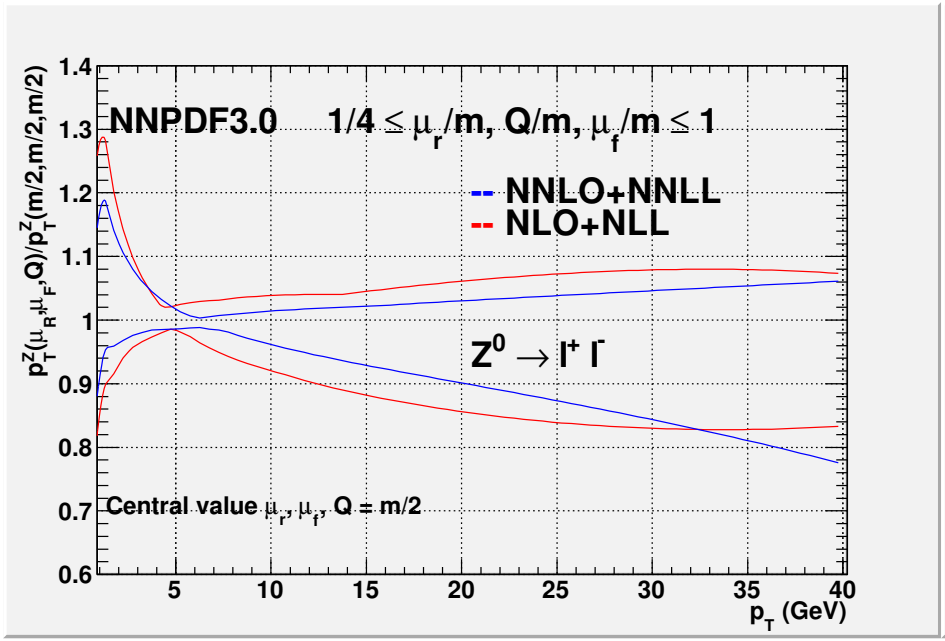
- NLO+NLL 20% spread in peaks, NNLO+NNLL reduces to about 15%;
- NLO+NLL: good prescription for higher order.

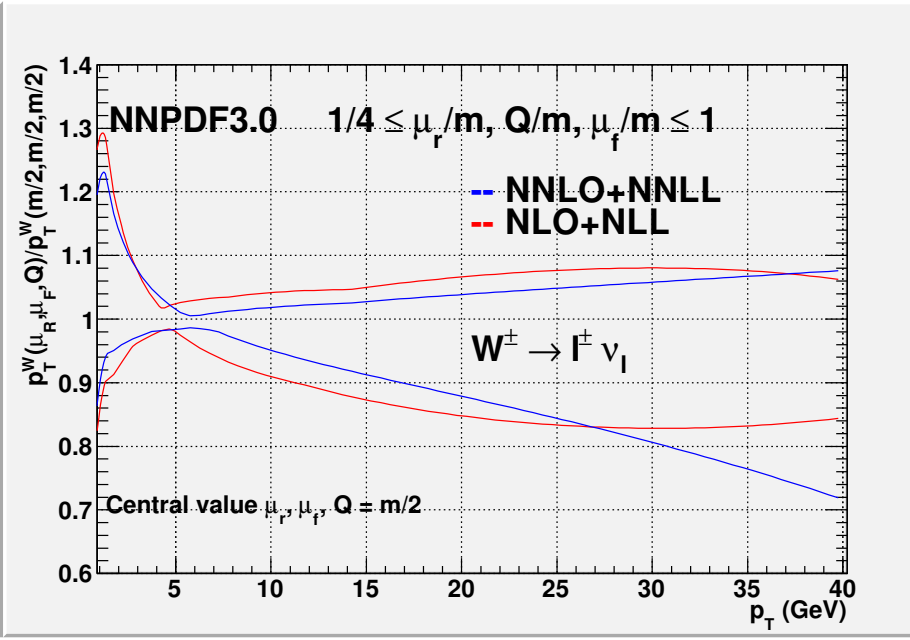
- p_T^Z **distributions**



- NLO+NLL 20% spread in peaks, NNLO+NNLL reduces to 15%;

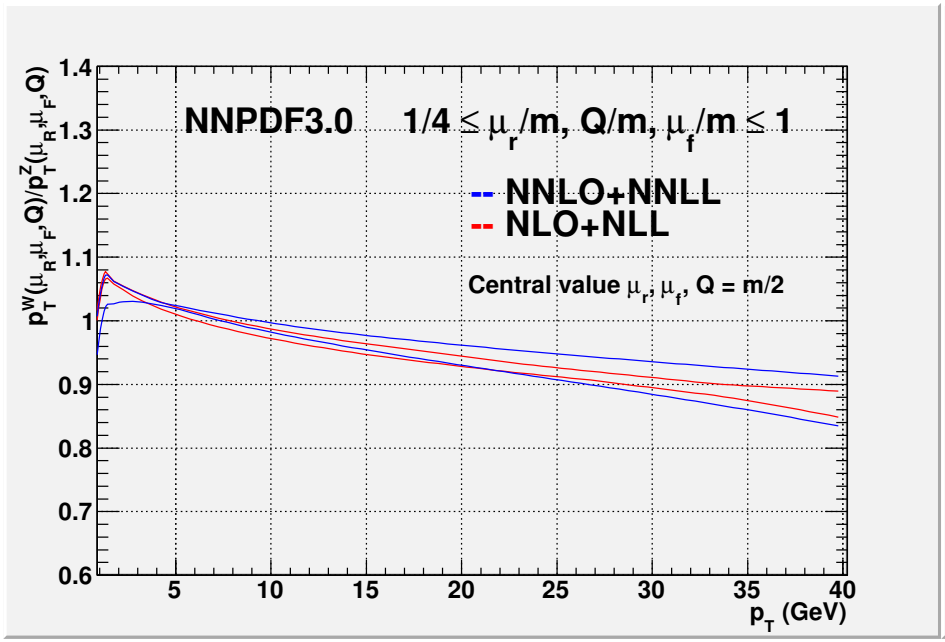
- p_T^W/p_T^W **and** p_T^Z/p_T^Z **ratio to the central value**

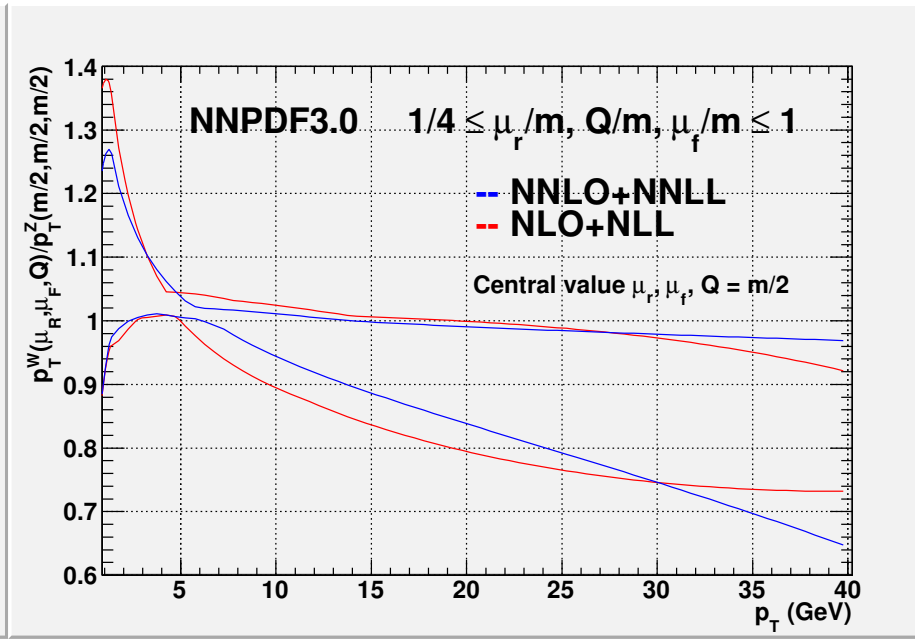




- Ratio $p_T^{Boson}(\mu_R, \mu_F, Q)/p_T^{Boson}(m/2, m/2, m/2)$;

- $p_T^W(\mu_R, \mu_F, Q)/p_T^Z(\mu_R, \mu_F, Q)$ **ratio distributions**

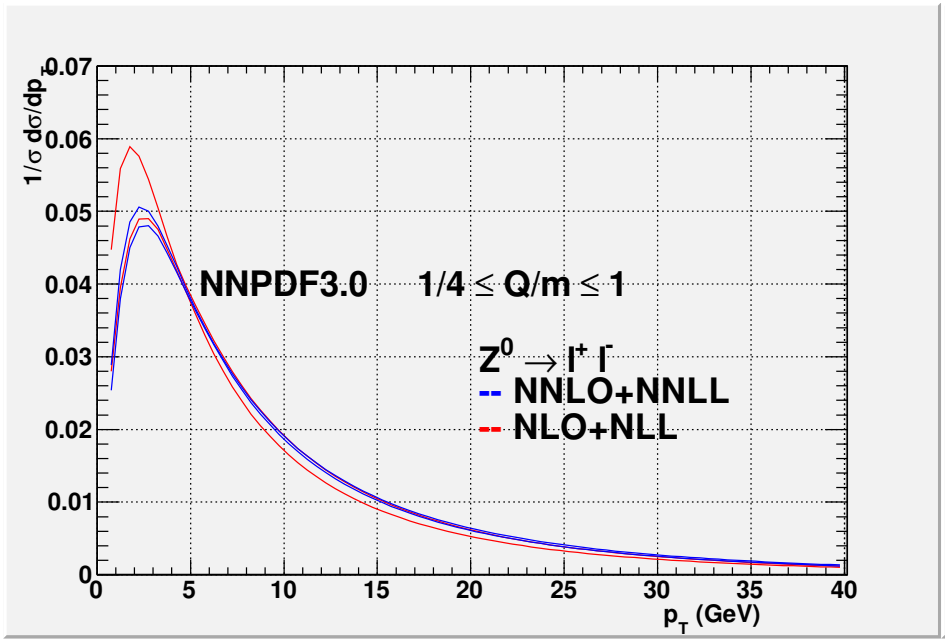


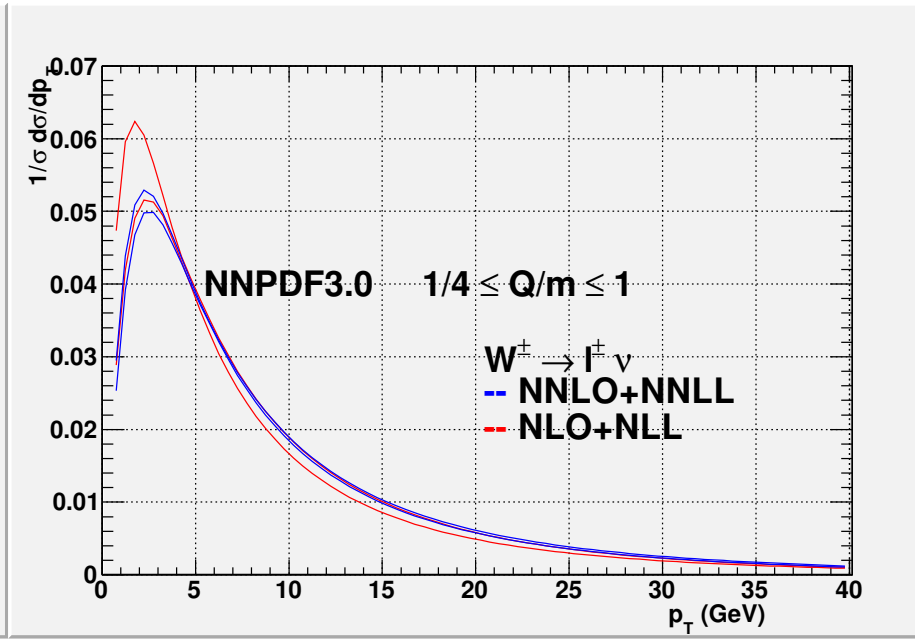


- *Left panel*: ratio $(\mu_R, \mu_F, Q)/(\mu_R, \mu_F, Q)$. *Right panel*: ratio $(\mu_R, \mu_F, Q)/(m/2, m/2, m/2)$.

Impact of the Resummation scale Q on p_T distributions

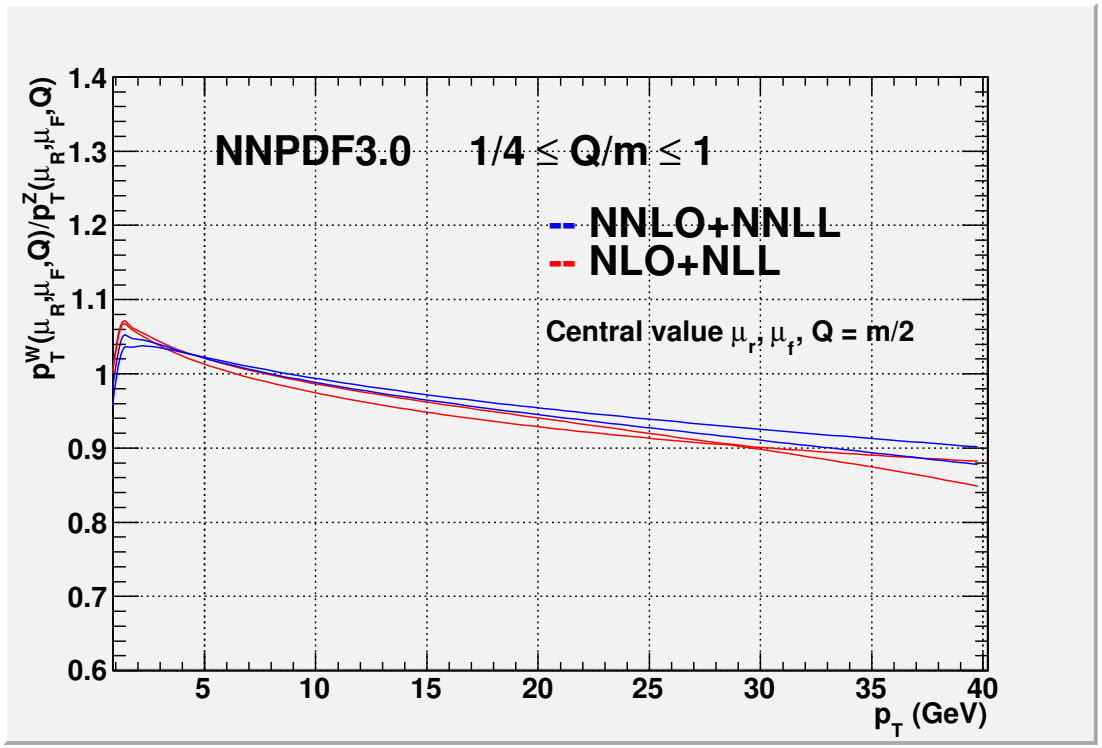
- p_T^Z **and** p_T^W **distributions**





- NLO+NLL 15% spread in peaks, NNLO+NNLL reduces to 3%;

- $p_T^W(\mu_R, \mu_F, Q)/p_T^Z(\mu_R, \mu_F, Q)$ **ratio distributions**



- Spread at most 3% in high-p_T region. No overlap between different orders.

- NNLO+NNLL bands are included in NLO+NLL in each case;
- Dependence from resummation scale provides thinner bands and NLO+NLL is not a good prescription for NNLO+NNLL;
- The complete scaling gives more stable ratio distributions;
- In ratios, for each order we have narrow bands around 5 GeV.