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The impact of the photon PDF and electroweak corrections on $t\bar{t}$ distributions

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We discuss the impact of EW corrections on differential distributions in top-quark pair production at the LHC and future hadron colliders, focusing on the effects of initial-state photons. Performing a calculation at Next-to-Leading Order QCD+EW accuracy, we investigate in detail the impact of photon-initiated channels on central values as well as PDF and scale uncertainties, both at order $\alpha_s\alpha$ and $\alpha_s^2\alpha$. We present predictions at 13 and 100 TeV, and provide results for the 8 TeV differential measurements performed by ATLAS and CMS. A thorough comparison of results obtained with the NNPDF2.3QED and CT14QED PDF sets is performed. While contributions due to the photon PDF are negligible with CT14QED, this is not the case for NNPDF2.3QED, where such contributions are sizeable and show large PDF uncertainties. On the one hand, we show that differential observables in top-pair production, in particular top-quark and $t\bar{t}$ rapidities, can be used to improve the determination of the photon PDF within the NNPDF approach. On the other hand, with current PDF sets, we demonstrate the necessity of including EW corrections and photon-induced contributions for a correct determination of both the central value and the uncertainties of theoretical predictions. The present content is based on arXiv:1606.01915 [hep-ph].

Summary

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