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Di-lepton Rapidity Distribution in Drell-Yan Production at N3LO in QCD

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The CERN Large Hadron Collider is a precision machine to test the Standard Model and demands equally precise theoretical predictions. State-of-the-art theory calculations at next-to-next-to-next-to-leading order (N3LO) in perturbative QCD are only available for a limited set of processes and observables. We compute for the first time the differential di-lepton rapidity distribution for the Drell-Yan (DY) production mediated via a virtual photon at N3LO. It is also the first time that the q_T -subtraction method is being applied at N3LO in a fully self-contained manner.

In this talk, we will first introduce the motivation why we need such precise theoretical predictions for DY production. Second, we explain the different ingredients of q_T -subtraction at N3LO, especially the 3-loop transverse momentum-dependent beam function. Third, we explain how we apply the q_T -subtraction method to get the differential di-lepton rapidity distribution for the Drell-Yan (DY) production at N3LO. Finally, we give a summary.

Primary author: YANG, Tongzhi

Presenter: YANG, Tongzhi

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