

Probing the proton structure with associated vector boson and heavy jet production at the LHC

We consider the production of Z bosons associated with heavy (charm and beauty) jets at the LHC energies using two scenarios based on the transverse momentum dependent (TMD) parton densities in a proton. The first of them employs the Catani-Ciafaloni-Fiorani-Marchesini gluon evolution and is implemented in the Monte-Carlo event generator `\textsc{pegasus}`. Here, the heavy quarks are always produced in the hard partonic scattering. The second scheme is based on the parton branching approach, currently implemented into the Monte-Carlo event generator `\textsc{cascade}`. In this scenario, the Z + jets sample is generated at the next-to-leading order with `MadGraph5_aMC@NLO` and then events containing the heavy jet in a final state are selected. We compare the predictions obtained within these two TMD-based approaches to each other, investigate their sensitivity to the TMD gluon densities in a proton and estimate the effects coming from parton showers and double parton scattering mechanism. Additionally, we compare our predictions with the results of traditional (collinear) pQCD calculations performed at NLO accuracy. It is shown that the TMD based CASCADE results do not contradict the LHC experimental data collected at $\sqrt{s} = 8$ and 13 TeV. We discuss the sensitivity of observables to the quark distributions in a proton and present predictions to search for the intrinsic charm signal in forthcoming analysis of the LHC experimental data.

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No

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