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Study of Parton Distribution Functions using the Muonic Decay Channel of Electroweak Bosons at ALICE

We study the role of Parton Distribution Functions (PDFs) in calculating cross sections of Drell-Yan processes in proton-proton collisions at $\sqrt{s} = 13.6$ TeV. The theoretical production cross-sections of $W^\pm$ and Z bosons are calculated via their muonic decay channel using POWHEG and PYTHIA8 event generators. The contributions from each parton's PDF are explicitly shown in the rapidity-differential cross sections of Drell-Yan processes. PDF uncertainties in rapidity-differential and total cross sections are calculated. Different methods for calculating PDFs are briefly discussed and multiple modern PDF sets from different research groups are compared. This study is performed while considering the perspectives for the upcoming measurement of muons produced during proton-proton collisions at $\sqrt{s} = 13.6$ TeV with the ALICE detector, on which a corresponding data analysis can be performed to constrain PDFs.

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