PROCEEDINGS OF SCIENCE

Study of the differential Drell-Yan cross sections at 13 TeV with CMS

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Studies of the differential Drell-Yan cross sections in the dilepton channel are presented. The analysis is based on data taken with the CMS detector at a proton-proton center of mass energy of 13 TeV. The cross sections are studied as a function of dilepton invariant mass and rapidity. Backgrounds are estimated using data-driven methods, and corrections including detector effects are discussed.

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1. Introduction

The Drell-Yan (DY) process is the process in which lepton pairs are produced via Z/γ* exchange. The differential cross section of this process is theoretically well established up to next-to-next-to-leading order (NNLO) in quantum chromodynamics (QCD). Precisely measured cross sections can not only be an effective input for the constraint on the parton distribution functions (PDFs) but also be used in various LHC new physics search [1] as a major background process. The differential cross sections of DY process were previously measured in ATLAS [2, 3] and CMS Collaborations [4, 5] at $\sqrt{s}$ = 7 and $\sqrt{s}$ = 8 TeV. This analysis presents study of the differential (dσ/dm) and double differential ($d^2\sigma/dmd|Y|$) cross sections of DY process in dilepton channel from 15 GeV to 3000 GeV with total 43 bins using proton-proton collision data collected with the CMS detector at $\sqrt{s}$ = 13 TeV. The cross section per each mass bin is calculated using the formula $\sigma = N / (A \cdot \varepsilon \cdot \mathscr{L}_{int})$ where N means the number of signal yields, and A, ε and $\mathscr{L}_{int}$ are the acceptance, efficiency and the integrated luminosity of the data respectively. Various Monte-Carlo (MC) samples are used in this analysis in order to estimate the signal and backgrounds. Signal MC sample is generated by aMC@NLO generator, and considered backgrounds are QCD, W+Jets, $t\bar{t}$, tW, $\bar{t}W$, $Z/\gamma^* \rightarrow \tau\tau$ and diboson processes. The order of analysis procedure is the event selection, background estimation, corrections, estimation of systematic uncertainties and results.

2. Results and Conclusion

The differential cross section was measured at $\sqrt{s}$ = 13 TeV data which corresponds to the integrated luminosity of 2.8fb^{-1} and it was also studied based on data taken with the CMS detector in 2016 with the study of double differential cross section measurement. Generally, theoretical prediction and experimental result show good agreement within the uncertainties.

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