

Measurement of $Z \rightarrow \mu\mu$ cross section in pp collisions at $\sqrt{s} = 13\text{TeV}$

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Abstract

I. INTRODUCTION

Z boson is a particle which mediate the weak interaction. The production of Z bosons in pp collisions is mainly via the weak Drell-Yan process. Z boson immediately decays into lepton-antilepton pairs. Cross section of $Z \rightarrow \mu\bar{\mu}$ can be measured by reconstructing muon data from the CMS detector.

Theoretical predictions are available at next-to-next-leading order (NNLO) in perturbative quantum chromodynamics (QCD). Precise measurements of $Z \rightarrow \mu\bar{\mu}$ cross section provide tests of perturbative QCD and validate the theoretical predictions of higher-order corrections. Monte Carlo simulation method is used for theoretical prediction.

II. THE CMS DETECTOR

The Compact Muon Solenoid (CMS) detector is a multi-purpose apparatus due to operate at the Large Hadron Collider (LHC) at CERN. CMS contains a silicon pixel and strip tracker, an electromagnetic calorimeter (ECAL), a hadron calorimeter (HCAL), superconducting solenoid, and a muon detector. The solenoid provides 3.8T magnetic field and this bends muon trajectory oppositely inside and outside. Muons are detected from silicon pixel and strip tracker, and muon detector.

A right-handed coordinate system is used with the origin at the nominal interaction point, the x-axis pointing to the center of the LHC ring, the y-axis pointing up (perpendicular to the LHC plane), and the z-axis along the anticlockwise-beam direction. The polar angle θ is measured from the positive z-axis and the azimuthal angle ϕ is measured in the xy-plane. The pseudorapidity is given by $\eta = -\ln \tan(\theta/2)$.

Z boson candidates are required to have reconstructed dimuon mass between 60 and 120GeV. Muons are triggered by $p_T < 15\text{GeV}$ and $|\eta| < 2.1$. Muons are reconstructed

from seed tracks in the muon detector with silicon pixel and strip tracker.

III. ANALYSIS

Event reconstruction, data selection.
Comparison with simulation
Dimuon mass plots

IV. RESULT

Cross section value.

V. CONCLUSIONS

Reference