

Xuan Chen – HEP Seminar – November 22, 2022  
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Title: Precision predictions for Drell-Yan production

Abstract:

Fundamental properties and parameters of an elementary particle lay the foundation of physics law. In the past few years, several precision measurements of elementary particles indicate deviations from the Standard Model. In this seminar, I will take the CDFII measurement of  $W$  boson mass as an introduction to the precision theory predictions of Drell-Yan production. A summary of the key ingredients for precision predictions will cover recent progress in perturbative QCD corrections and parton evolutions at the third order (N<sup>3</sup>LO) of QCD, mixed QCD-EW correction at NNLO as well as the fourth order QCD correction of small transverse momentum resummation. I will then discuss the impact of precision theory input to the measurements of  $W$  and  $Z$  boson's properties such as their mass, width and transverse momentum distributions at the Tevatron and the LHC.