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LHC Higgs Working Group*

Public Note

Update Predictions for Production Cross Sections of the Higgs Boson at the LHC

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Abstract This note documents state of the art predictions for the production cross sections of the Higgs Boson at the LHC. Specifically, Standard Model predictions for the LHC with centre-of-mass. energy of 7, 8, 13, 13.6 and 14 TeV are presented.

*https://twiki.cern.ch/twiki/bin/view/LHCPhysics/LHCHWG

Introduction

Production cross sections for the Higgs boson based on the Standrad Model of particle physics were collected in the CERN Yellow Report "Deciphering the Nature of the Higgs Sector" (YR4) (CERN-2017-002) [1]. Since this document became public many advancements in our abilities to predict production cross sections were achieved. Furthermore, the LHC performed measurements at a higher centre-of-mass energy of 13.6 TeV for which YR4 does not contain any predictions. Looking ahead to Run-3 and the High Luminosity phase of the LHC (HL-LHC) and the associated wealth of data that will be collected an update of the HWG recommendation of all production cross sections to reflect the current state of the art is called for. The aim of this note is to document recent advancements and review the ingredients for the prediction of Standard Model predictions for the production cross sections of the Higgs boson at the LHC (similar in spirit as in YR4). Updated numerical predictions for central values of the production cross sections and associated theoretical and parametric uncertainties are the main result of this article.
For now, instructions and input parameters for the generation of numerical values can be found here: `https://twiki.cern.ch/twiki/bin/view/LHCPhysics/LHCHWG136TeVxsec`

ggF

VBF

VH

$t\bar{t}H$ and tH

$b\bar{b}H$

Conclusions

Acknowledgments

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Bibliography

[1] LHC Higgs Cross Section Working Group collaboration, D. de Florian et al., *Handbook of LHC Higgs Cross Sections: 4. Deciphering the Nature of the Higgs Sector*, 1610.07922.