Random collection of top, higgs and DECAL studies

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ABSTRACT

X was measured, we showed that $Y \neq Z$ and that $M_{\mathrm{H}} = 126$ GeV/c^2.

DECLARATION OF AUTHORS CONTRIBUTION

I did this, and that, and some of the other.

ACKNOWLEDGEMENTS

I would like to thank bla, and bla ...

Motto or dedication

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DEFINITIONS OF ACRONYMS

LHC Large Hadron Collider
Superconducting collider occupying the 27 km ring at CERN.

QCD Quantum Chromodynamics

The Higgs discovery is cited [1]

CHAPTER 1

INTRODUCTION

Following the discovery of the Higgs, there is no clear direction in which high erngy physics should proceed. Many reasons to continue searches- hierarchy problem, dark matter, matter-antimatter asymmetry- but few bounds on the energy scale required to see them. Two main ways for experiments to proceed- push the energy frontier to search for high mass particles, push the precision frontier to find small deviations from the standard model or hard to detect processes. For high energy physics use hadron collider, precision use lepton. Explain benefits of both types. Both types being pursued- FCC and ILC/CLIC, described in chapter xx. Here we will focus on the later.

CHAPTER 2

Theory

Moriond talk should be useful for deciding content here!!

Physics program for colliders- three main areas will be higgs top and BSM physics

2.1 Higgs

Plot of Higgs production cross sections vs energy

2.1.1 HiggsStrahlung

Model independent measurements Mass Width Couplings

2.2 Top

Mass Width AFB EW Couplings

2.3 BSM

Predictions for SUSY

CHAPTER 3

Experiments

Mainly take from midterm!!!

3.1 CLIC

3.2 ILC

3.3 Framework

Shared analysis framework

3.3.1 Particle Flow

3.4 Detectors

3.4.1 ILD

mention difference between ILD and CLIC_ILD

3.4.2 SiD

Leave description of DECAL concept to DECAL chapter but mention it as one of the ECAL alternatives here

CHAPTER 4

Higgs Analysis

Reinforce context for measurement as part of the higgs width measurement

Take everything from analysis note!!

lepton finding

jet finding- higgs and W mass plots

btagging

describe BDTs

final selection and uncertainty

Impact of this on the overall higgs measurements at CLIC & compare to Higgs to qqqq channel

CHAPTER 5

Top Tagging

Generic top tagger, explain overall approach of using 6 BDTs

Overall analysis method

If we end up with cut on the energy, start with full energy range analysis to highlight problems

Explain it will be tested in terms of AFB. Explain importance of AFB measurement

5.1 lepton finding

Method- based on using Pandora ID and jet isolation

Lepton finding efficiency Asymmetry Gamma correction for electrons Charge tagging efficiency QbyP

5.2 jet finding

Concept of fat jets reconstruction efficiency in terms of theta Compare alogrithms in terms of top mass and angle for reconstruction Compare methods picking the correct

5.2.1 fat jet properties

Multiplicity- systematic uncertainty Angular relations nSubjettiness

5.3 ISR effects

Photon energy vs angle Inability to reconstruct leptonic top Boost introduced to $t\bar{t}$ system Imact on reconstrcuted angle

5.4 event selection

No need to re-explain BDTs but should explain why and how we use 6 bdts Final selection results for a particular working point

5.5 AFB determination

Methods for calculating it and variation between them- Effect of ISR Effect of BDT selection Background modelling

Potentially adding cuts on acceptance- need to add in extrapolation??

CHAPTER 6

DECALStudies

General concept- energy proportional to nParticles

Explain potential benefits- cheape, same tech as inner detectors, granularity could improve particle flow

Description of Mokka & Geant4

Detector changes implemented for simulations- smaller pixel size, active silicon replaced with thinner active silicon layer and passive silicon layer

6.1 DigiMAPs

Various effects on resolution Charge Spread Background Noise Signal Noise Clustering Threshold

6.2 Design Optimization

Aspect Ratio for resolution Linearity Leakage= do studies based on change in radiator- tungsten vs lead

6.3 Hardware studies

Assuming this ever works....

CHAPTER 7

Conclusion

REFERENCES

[1] G. Aad *et al.*, "Observation of a new particle in the search for the Standard Model Higgs boson with the ATLAS detector at the LHC," *Phys. Lett. B*, 2012.

APPENDIX A

FIRST APPENDIX

Tables of datapoints...