Master Advanced Lab Course
Universität Göttingen – Fakultät für Physik

Report on the experiment KT.HIP

Higgs physics with the ATLAS experiment

Name:	Eric Bertok
Email:	eric.bertok@stud.uni-goettingen.de
Conducted on	19th April 2018
Assistant:	K. Abeling
Copy of document requested:	□ yes ☑ no
Unterschrift:	

Submission

Date: Signature of assistant:

Review

Date: Name of examiner:

Points: Signature:

Mark:

Contents

1. Introduction

The goal of this experiment is the determination the of the branching ratio of the W boson BR($W \to \mu\nu$). First, W and Z bosons are reconstructed using data provided by the Tevatron collider at Fermilab. By comparing with monte-carlo simulations, selection parameters are obtained, which allow for clean cuts for filtering out background events (jets and cosmic source). The mass and the transverse mass is then determined for the Z and W boson respectively. Finally the branching ratio is calculated from the number of selected events, the trigger efficiencies, as well as the reconstruction efficiencies.

2. Theory

3. Experimental setup and methods

4. Analysis

5. Discussion

References

[1] *Partlicle Data Group: gauge boson summary sheet*. `http://pdg.lbl.gov/2017/tables/rpp2017-sum-gauge-higgs-bosons.pdf`. – Zugriff:2018-01-31

[2] *Praktikumshandbuch*. master-fp.physik.uni-goettingen.de. – Zugriff:2018-01-31

[3] *Public web page of the DØ experiment*. `http://www-d0.fnal.gov/public/index.html`. – Zugriff:2018-01-31

[4] : *Pythia homepage*. `http://home.thep.lu.se/Pythia/`

[5] : *ROOT homepage*. `https://root.cern.ch/`

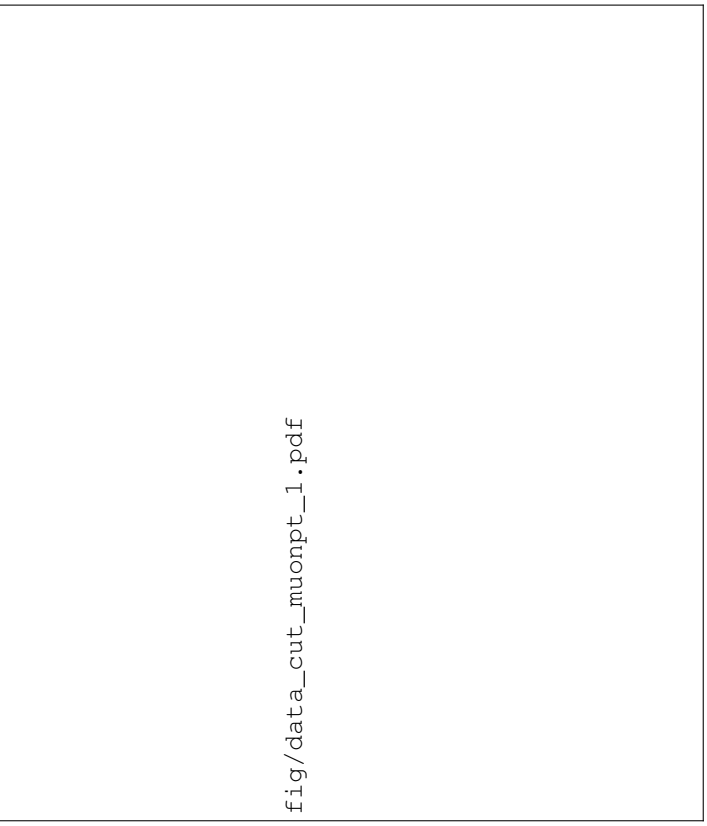
[6] : *Tag and probe, twiki*. https://twiki.cern.ch/twiki/bin/view/CMSPublic/TagAndProbe

[7] : *Treatment of Errors in Efficiency Calculations*. `http://th-www.if.uj.edu.pl/~erichter/dydaktyka/Dydaktyka2012/LAB-2012/0701199v1.pdf`

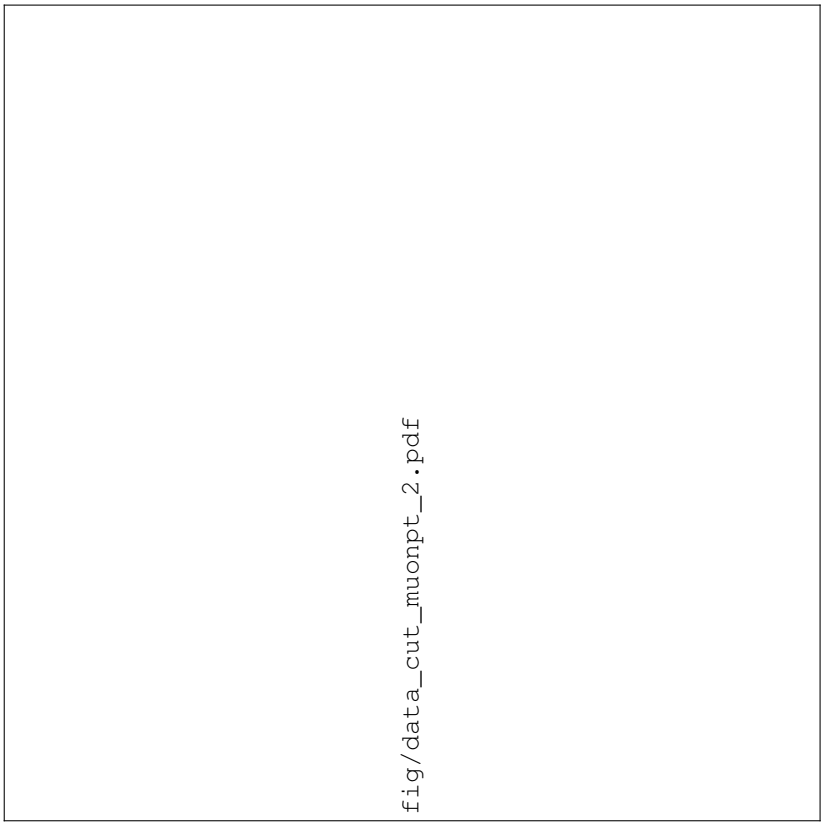
[8] *Wikipedia: electroweak interaction*. `https://de.wikipedia.org/wiki/Elektroschwache_Wechselwirkung`. – Zugriff:2018-01-31

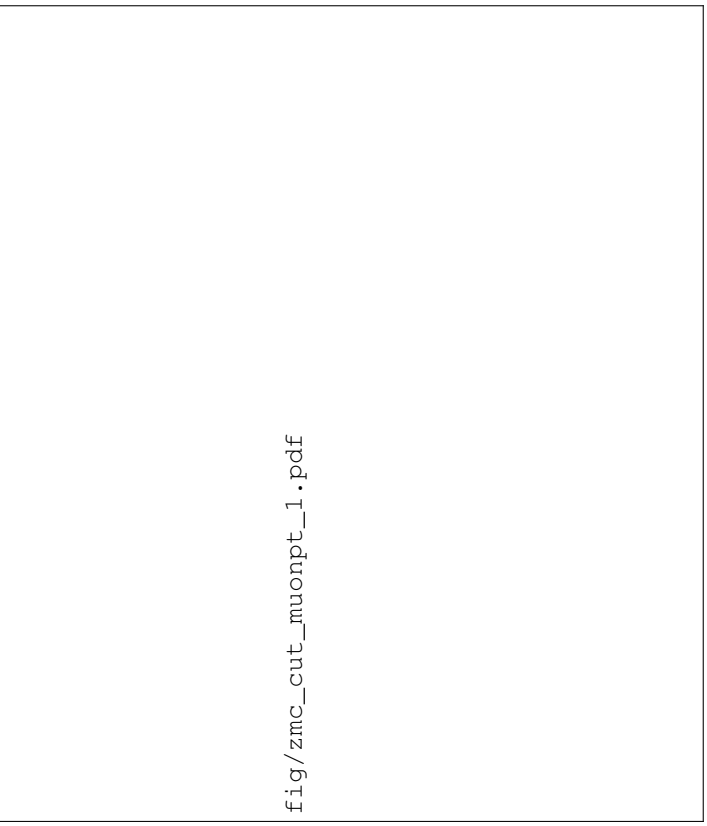
[9] THOMSON, Mark: *Modern Particle Physics*. Cambridge University Press, 2013

A. Z boson additional plots

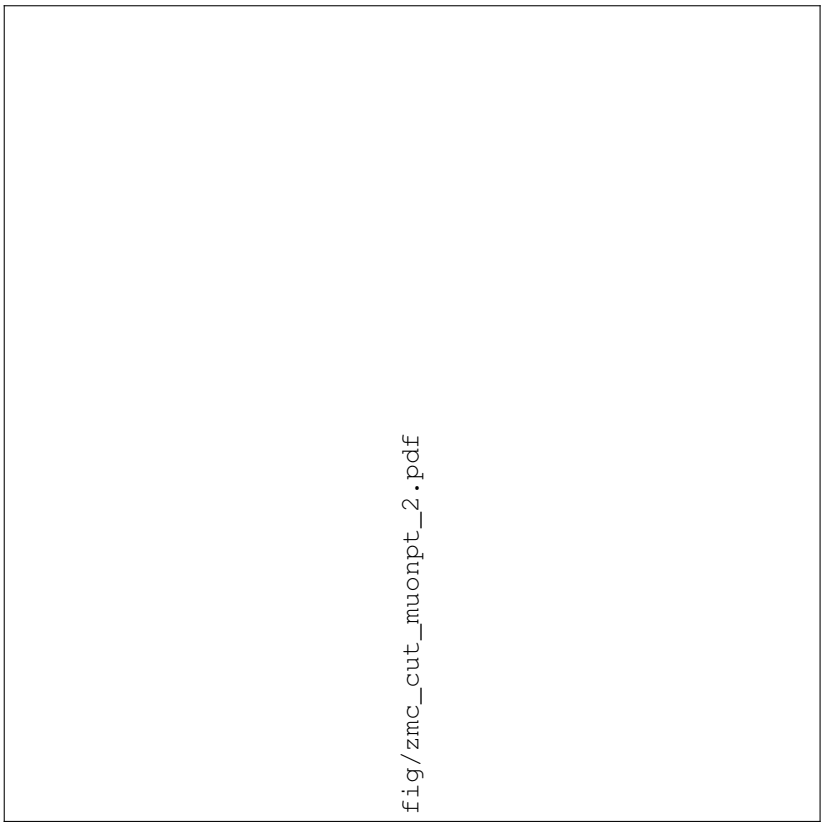

fig/data_cut_muonpt_1.pdf

(b)


fig/data_cut_muonpt_2.pdf


fig/zmc_cut_muonpt_1.pdf

(a)


fig/zmc_cut_muonpt_2.pdf

fig/zmc_cut_chisqdof1.pdf

(a)

fig/zmc_cut_chisqdof2.pdf

fig/data_cut_chisqdof1.pdf

(b)

fig/data_cut_chisqdof2.pdf

fig/data_cut_ehalo1.pdf

(b)

fig/data_cut_ehalo2.pdf

fig/zmc_cut_ehalo1.pdf

(a)

fig/zmc_cut_ehalo2.pdf