ATLAS 13 TeV Data Analysis using Particle Flow

Christian Kirfel

Bachelorarbeit in Physik
angefertigt im Physikalischen Institut

vorgelegt der
Mathematisch-Naturwissenschaftlichen Fakultät
der
Rheinischen Friedrich-Wilhelms-Universität
Bonn

November 2016

Ich versichere, dass ich diese Arbeit selbstständig verfasst und keine anderen als die angegebenen Quellen und Hilfsmittel benutzt sowie die Zitate kenntlich gemacht habe.

Bonn, ...
Datum Unterschrift

1. Gutachter: Prof. Dr. John Smith
2. Gutachterin: Prof. Dr. Anne Jones

Acknowledgements

I would like to thank ...

You should probably use `\chapter*` for acknowledgements at the beginning of a thesis and `\chapter` for the end.

Contents

CHAPTER 1

Theoretical and experimental basics

1.1 The Standard Model of Particle Physics

The Standard Model of Particle Physics summarizes the current knowledge of fundamental particles and their interactions. The model holds at scales of 1 fm and below. Gravity, being the fourth fundamental force is not included because it is negligible for most phenomena at this scale. The current view is that all matter is made out of three kinds of elementary particle being leptons quarks and mediators. There are six leptons falling into three families according to charge, electron number, muon number and tau number. To each of these leptons there also is an antilepton with all signs reversed. Similiar to that there are six flavors of quarks separated by Strangeness (S), charm (C), Beauty (B), and truth (T). As well as the leptons the quarks fall into three generations.

1.2 The LHC and ATLAS

The analysis for this thesis has been performed in the ATLAS collaboration. The ATLAS-Detector is one of the four big experiments at the LHC at Cern. Therefore this chapter gives a brief overview over the LHC and ATLAS focusing on the properties directly relevant for Particle Flow Analysis.

1.2.1 The LHC

The Large Hadron Collider ("LHC") at CERN was built to extend the frontiers of modern particle physics by delivering high luminosities and unprecedented high energies.
The LHC is designed to collide bunches of up to 10^{11} protons

1.2.2 The ATLAS Detector

1.3 The Particle Flow Algorithm

Recently only either the Calorimeter or the tracker information was used to reconstruct Jets in ATLAS events. The Particle Flow Algorithm combines tracker and calorimeter information to achieve better resolution especially at lower energies. The main advantages of including the tracker information into reconstruction are listed here:

- better resolution at low pt

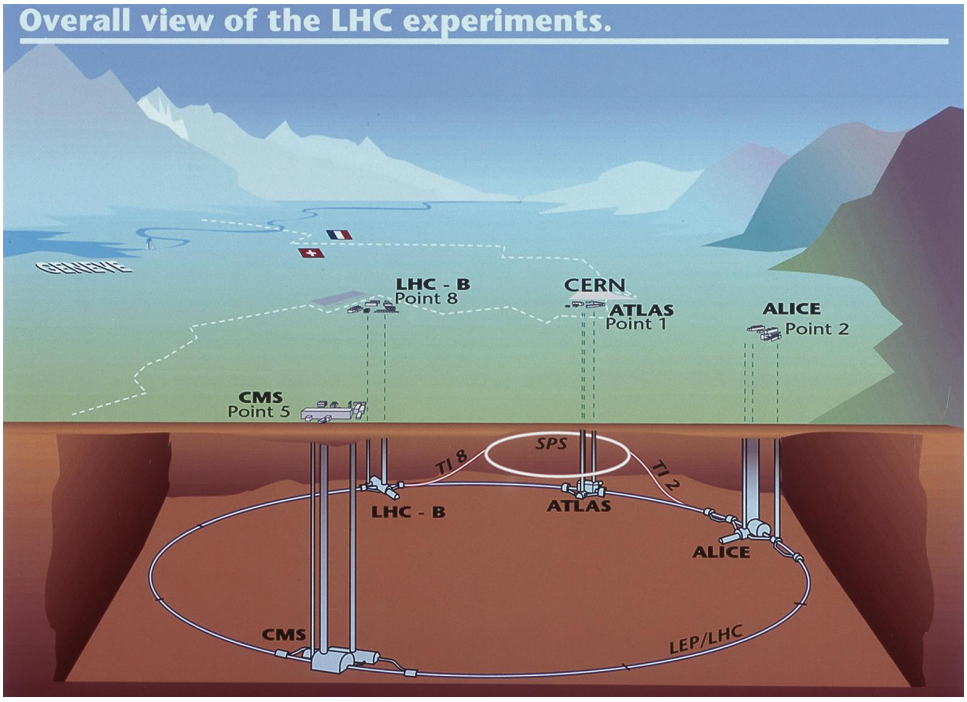

Figure 1.1: Sketch of the LHC ring, the position of the experiments and the surrounding countryside. The four big LHC experiments are indicated. The location of the injection lines and the SPS are also shown.

- better angular resolution
- better tru

1.4 Calibration in Particle Flow and its difficulties at the time

CHAPTER 2

Results

I know nothing

Bibliography

[1] D. Griffiths, *Introducton to Elementary Particles*, 2nd ed., WILEY-VCH, 2008.

APPENDIX A

Useful information

In the appendix you usually include extra information that should be documented in your thesis, but not interrupt the flow.

List of Figures

List of Tables