Department of Physics and Astronomy

University of Heidelberg

Master thesis

in Physics

submitted by

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born in Mannheim

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A study of the decay

$$\Lambda_b^0 \to D^0 p \mu^- \overline{\nu}_\mu X$$

with the LHCb experiment

This Master thesis has been carried out by (Name Surname)

at the

(institute)

under the supervision of

(Frau/Herrn Prof./Priv.-Doz. Name Surname)

(Titel der Masterarbeit - deutsch):

(Abstract in Deutsch, max. 200 Worte. Beispiel: **?**)
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1 Introduction

2 The LHCb detector

Most parts of this chapter are taken from **?**

The LHCb experiment is one of the four big experiments, currently running at the Large Hadron Collider (LHC) of the European Organization for Nuclear Research CERN in Geneva, Switzerland. In contrast to the other three experiments – ATLAS and CMS are searching for direct hints of new physics, ALICE investigates the Quark-Gluon-Plasma – LHCb is dedicated to look indirectly for physics beyond the Standard Model (see section 3) by the study of hadrons containing either a heavy b- or c-quark.

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The layout of the LHCb detector can be seen in figure 2.1. It is built as a single-arm forward spectrometer. The reason for this choice is, that at LHC energies of $\sqrt{s} = 14\,\text{TeV}$ at the maximum, b- and $\bar{b}$- hadrons are predominantly produced in the forward (or backward) region.

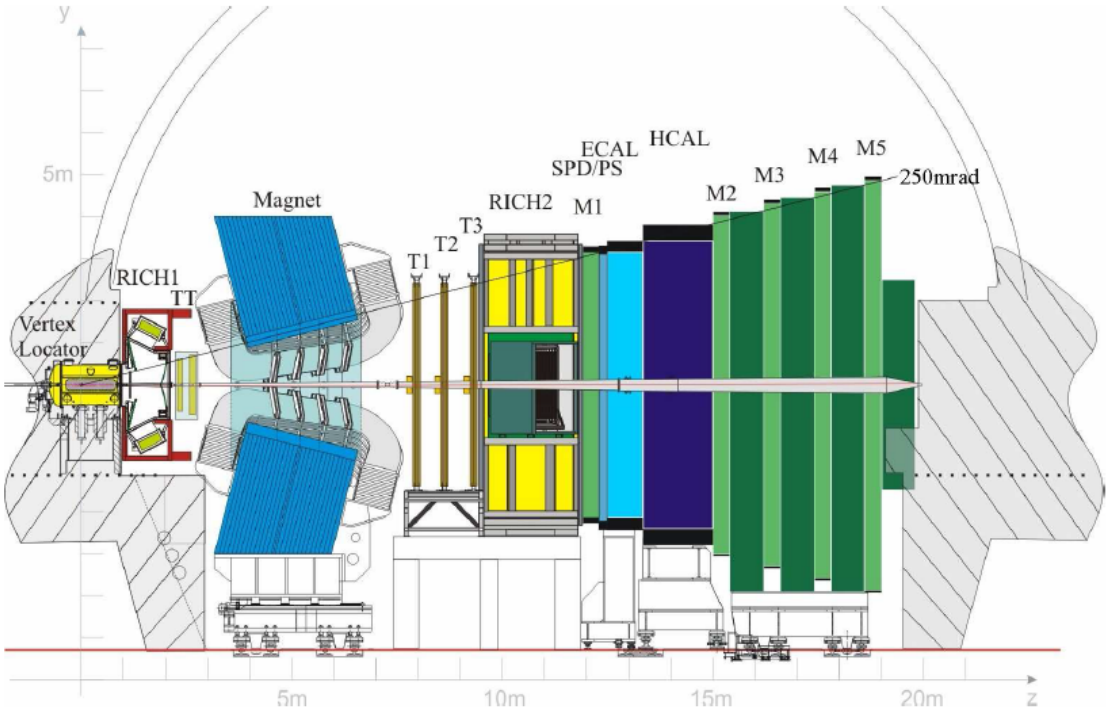

Figure 2.1: The LHCb detector.

2.1 Tracking detectors

Tracking describes the whole procedure to reconstruct the trajectories of the (charged) particles produced in the proton-proton collision. If there's a magnet in use, the particles' charges and momenta can be determined as well. For that purpose, a system of several subdetectors is aligned up- and downstream the dipole magnet, namely the Vertex locator (VELO), the Trigger Tracker (TT) and the Trigger stations (T1-T3) built-up by the Inner Tracker (IT) and the Outer Tracker (OT).

2.1.1 Vertex locator (VELO)

2.1.2 Trigger Tracker / Tracker Turicensis (TT)

2.1.3 Inner Tracker (IT)

2.1.4 Outer Tracker (OT)

2.1.5 Track classification

2.2 Particle identification

2.2.1 Ring Imaging Cherenkoy Detector (RICH)

2.2.2 Calorimeter system

2.2.3 Muon chambers

2.3 Trigger

2.3.1 L0-Trigger

2.3.2 High Level Trigger (HLT)

3 Theory and motivation

3.0.3 The Standard Model of Particle Physics

3.0.4 Baryons

3.0.5 Resonances

Part I

Appendix

A Lists

A.1 List of Figures

A.2 List of Tables

Erklärung:

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

Heidelberg, den (Datum) .....