Search for Higgs Decay to Dark Matter and Trigger Studies

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for the degree of Doctor of Philosophy

Abstract

Here the abstract of the thesis

Declaration

Is this needed?

Acknowledgements

I would like to thank Fundação para a Ciência e a Tecnologia (FCT) for their support of my PhD work through their grant SFRH/BD/77979/2011.

TODO: Include FCT symbols

Preface

Thesis structure and so on...

"To my grand mother"

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Chapter 1

Theory

TODO: Something

1.1 Standard Model of Particle Physics

TODO: Very brief summary of the Standard Model.

The Standard Model (SM) of particle physics is the currently accepted model for describing the physics of elementary particles.

1.2 Higgs Mechanism

Summary of the Higgs Mechanism. Should include

- Motivations
- Explanation of the mechanism itself
- Consequences
- Possible decays

1.3 Higgs Invisible decays

TODO: Explain what are SM Higgs invisible decays. Go over the possibility of BSM invisible decays.

Chapter 2

Experimental Apparatus

2.1 The Large Hadron Collider

TODO:

- CERN basics location etc
- Basics of machine and operation
- New to include Instantaneous luminosity equation

The Large Hadron Collider [?] is a 27 km synchrotron machine located in Geneva Switzerland.

Luminosity Equation

$$L = \frac{N_b^2 n_b f_{\mathrm{rev}} \gamma}{4\pi \epsilon_n \beta^*} F, \tag{2.1}$$

2.2 The Compact Muon Solenoid Experiment

Detector description

2.2.1 Tracker

2.2.2 Electromagnetic Calorimeter

2.2.3 Hadronic Calorimeter

2.2.4 Solenoid Magnet

2.2.5 Muon System

2.2.6 Data Acquisition System

2.2.7 Trigger System

The upgrade tdr [**?**].

2.2.8 Computing

Data Quality Monitoring (DQM) and DQM

2.2.9 Run II Updgrades

Chapter 3

Physics Objects and Monte Carlo simulation

3.1 Physics objects definition

3.1.1 Electron

3.1.2 Muon

3.1.3 Tau

3.1.4 Jets

3.1.5 Missing Transverse Energy

3.2 Monte Carlo simulation

Chapter 4

Technical work

4.1 Level 1 Trigger Data Quality Monitoring System

Hello

Chapter 5

Physics Analysis

5.1 Prompt/Parked trigger studies

5.2 Prompt Analysis

5.3 Parked Analysis

5.4 Run II trigger studies

5.5 Run II Analysis

Chapter 6

Conclusions

Summary of relevant results and their impact on Particle Physics

Acronyms

DQM Data Quality Monitoring. 6, 15

FCT Fundação para a Ciência e a Tecnologia. vii, 15

L1T Level 1 Trigger. 15

LHC Large Hadron Collider. 15

MET Missing Transverse Energy. 15

SM Standard Model. 3, 15