

Searches for Supersymmetry using the α_T variable with the CMS detector at the LHC

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Abstract

Supersymmetry does not exist

Declaration

This thesis is the result of my own work, except where explicit reference is made to the work of others, and has not been submitted for another qualification to this or any other university. This dissertation does not exceed the word limit for the respective Degree Committee.

Darren Burton

Acknowledgements

Of the many people who deserve thanks, some are particularly prominent....

Preface

This thesis will never be read by anyone.

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“The Universe is about 1,000,000 years old.”

— Matthew Kenzie, 1987-present : Discoverer of the Higgs Boson.

Chapter 1

Introduction

Introduce the thesis [\[1\]](#)

Chapter 2

A Theoretical Overview

The hard part the thesis

2.1 The Standard Model

The SM is great

2.2 Motivation for Beyond the Standard Model Physics

Dark Matter etc

2.3 Supersymmetry

What is this theory that doesn't exist all about?

Chapter 3

The LHC and the CMS Detector

Probing the Standard Model for signs of new physics would not be possible without the immensely complex

This chapter will cover CERN's Large Hadron Collider (LHC) and the CMS detector, being the experiment the author is a member of. Section 3.2 serves to introduce an overview of the different components of the CMS detector, with more detail spent on those that are relevant in the search for Supersymmetric particles. Section 3.3 will focus on event and object reconstruction again with more emphasis on jet level quantities which are most relevant to the author's analysis research. Finally Section 3.4 will cover work performed by the author, as service to the CMS Collaboration, in measuring the performance of the GCT component of the L1 trigger during the 2012-2013 run period.

3.1 The LHC

The LHC is a storage ring, accelerator, and collider of circulating beams of protons or ions. Housed in the tunnel dug for the Large Electron-Positron collider (LEP), it is approximately 27 km in circumference, 100 m underground, and straddles the border between France and Switzerland outside of Geneva. It is currently the only collider in operation that is able to study physics at the TeV scale.

3.2 CMS detector

Detector stuff

3.3 Object Definition

Object stuff

3.3.1 Jets

Jets

3.3.2 B-tagging

B-tagging

3.4 L1 Trigger

L1 Work

Chapter 4

Searches for SUSY at the LHC

Generic susy searches. What we look for etc

4.1 The α_T search

Stuff about the α_T variable

4.2 Searches for Natural SUSY with B-tag templates.

Btag Templates blah blah

Chapter 5

Results

Results at 12fb 8TeV

5.1 Statistical Interpretation

Likelihood stuff

5.2 Interpretation in Simplified Signal Models

Result interpretation

Bibliography

- [1] LHCb, S. Amato *et al.*, CERN-LHCC-98-4.

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