

UNIVERSITY OF CALIFORNIA
SANTA CRUZ

**AN INCLUSIVE SEARCH FOR THE DECAY OF A BOOSTED
HIGGS BOSON IN THE $H \rightarrow b\bar{b}$ CHANNEL WITH THE ATLAS
DETECTOR**

A dissertation submitted in partial satisfaction of the
requirements for the degree of

DOCTOR OF PHILOSOPHY

in

PARTICLE PHYSICS

by

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Abstract

An Inclusive Search for the decay of a Boosted Higgs boson in the $H \rightarrow b\bar{b}$
channel with the ATLAS detector

by

Jacob Martin Pasner

The large Hadron Collider provides the ideal testing grounds for the fundamental building blocks of our universe.

To my family

You never doubted me

And always made me laugh

Acknowledgments

I would like to thank my committee for their dutiful efforts to make this document one I can be proud of for the rest of my life. Furthermore, I would like to thank the SCIPP collaboration and UCSC Physics Department for their support in both academic and personal arenas.

Chapter 1

Introduction

Every dissertation should have an introduction. You might not realize it, but the introduction should introduce the concepts, background, and goals of the dissertation.

Title	Author
War And Peace	Leo Tolstoy
The Great Gatsby	F. Scott Fitzgerald

Table 1.1: A normal size table. There has been a complaint that table captions are not single-spaced. This is odd because the code indicates that they should be.

Table 1.2: A small table.

Title	Author
War And Peace	Leo Tolstoy
The Great Gatsby	F. Scott Fitzgerald

Part I

Theoretical Motivations and the Standard Model

Chapter 2

The Standard Model and Beyond

The pinnacle of humanities ability to represent the fundamental fields and particles that build the universe, the Standard Model is the guiding theoretical basis of particle physics.

2.1 Broken Symmetries and Nobel Prizes

Its July 4th, 2012 and the walls of building 500 are reverberating as Particle Physicists around the world rejoice the discovery of the particle that gives all things mass, the Higgs Boson.

Part II

Experimental Apparatus and Associated Facilities

Chapter 3

The Large Hadron Collider and ATLAS detector

CERN represents the highest concentration of both experimental knowhow and actual physical experimental apparatus for particle physics on this planet.

3.1 The Large Hadron Collider

Located 100 meters under the Swiss / French boarder lies the 13 kilometer Large Hadron Collider. The culmination of a huge international collaboration, this apparatus is capable of colliding protons at a center of mass energy of $\sqrt{s} = 13$ TeV.

3.2 A Torroidal Large Hadron Collider Apparatus (ATLAS)

So big, so beautiful, so data.

Part III

The HbbISR Analysis

Chapter 4

Triggering and Data Acquisition

Chapter 5

ATHENA Event Reconstruction

Part IV

Previous Analysis

Chapter 6

Vector Boson Fusion + γ production of
Higgs decaying to $b\bar{b}$

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Appendix A

Some Ancillary Stuff

Ancillary material should be put in appendices, which appear after the bibliography.