A SEARCH FOR LEPTON FLAVOR VIOLATING DECAYS OF THE HIGGS BOSON and a Measurement of W Boson Production using the CMS Detector at the LHC

by

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Abstract

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${\bf Acknowledgements}$

This is where any acknowledgements would go.

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Theoretical Motivation

1.1 The Standard Model

Elementary Particles

Elementary Forces: This will include a description of the W Boson

The Higgs Boson

1.2 Beyond the Standard Model: Mention BSM theories that predict an LFV Higgs, mention why we know that there must be new physics beyond the Standard Model, motivate LFV Higgs

LHC Phenomenology

- 2.1 Proton-Proton Collisions
- 2.2 W Boson Production
- 2.3 Higgs Boson Production

Experimental Design: The Headings below are self explanatory

- 3.1 LHC
- 3.2 CMS

Overview

Tracker

ECAL

HCAL

Muon System

Trigger

Event Simulation

4.1 Monte Carlo Event Generation

Matrix Elements

Parton Showering and Hadronization

Monte Carlo Generators: Overview of different monte carlo generators

4.2 Detector Simulation

Event Reconstruction: Discuss how
physics objects are reconstructed from
detector deposits or lack thereof

- 5.1 Particle Flow
- 5.2 Electrons
- 5.3 Muons
- 5.4 Hadrons
- 5.5 Jets
- 5.6 MET

Analysis Methods: Summarize W+Jets and LFV Higgs ANs

6.1 Background Estimation

Monte Carlo Samples Used: This section will simply list the Monte Carlo samples used, in contrast with the Monte Carlo Generation section which will list the different Monte Carlo generator techniques.

QCD Estimation

Tau Embedding

Fake Rate Method

6.2 Selection Optimization

W+Jets

LFV Higgs

6.3 Systematic Uncertainties

W+Jets

LFV Higgs

Results

7.1 LFV Higgs

Statistical Methods: Explain statistics behind calculations of limits, branching ratios

8 TeV Results

13 TeV Results

7.2 W+Jets

Detector Unfolding

13 TeV Results

Conclusions

- 8.1 Summary
- 8.2 Future Outlook