

A SEARCH FOR THE HIGGS BOSON DECAYING TO TAU PAIRS AT THE
CMS EXPERIMENT

Abstract

by

Louis James Antonelli

This thesis describes an experimental search for the Higgs boson. The search has been carried out at the Compact Muon Solenoid experiment using proton-proton collisions produced by the Large Hadron Collider. The dataset analyzed corresponds to the 4.6 fb^{-1} of data taken at $\sqrt{s} = 7 \text{ TeV}$ during the 2011 running period. This analysis attempts to identify events in which a Higgs decays to two tau leptons and one tau decays electronically and the other decays hadronically. A search is performed for a Higgs as predicted by the Standard Model of Particle Physics, and additionally a search is conducted for a Higgs in the context of the Minimally Supersymmetric Standard Model. The results are consistent with the background expectations and so upper limits are placed on the Higgs production cross-section times the branching ratio to tau leptons. In the Standard Model Higgs search, this analysis is able to exclude a Higgs at roughly 5x the Standard Model prediction.