University of Victoria | Graduate Studies

Notice of the Final Oral Examination for the Degree of Doctor of Philosophy

of

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"Search for Direct Scalar Top Pair Production in Final States with Two Tau Leptons in pp Collisions at ps = 8 TeV at the ATLAS Detector at the Large Hadron Collider"

Department of Physics and Astronomy

Tuesday, September 26, 2017
1:30 P.M.
Clearihue Building
Room B017

Supervisory Committee:
Dr. Robert Kowalewski, Department of Physics and Astronomy, University of Victoria (Co-Supervisor)
Dr. Isabel Trigger, Department of Physics and Astronomy, University of Victoria (Co-Supervisor)
Dr. Randall Sobie, Department of Physics and Astronomy, UVic (Member)
Dr. Adam Monahan, School of Earth and Ocean Sciences, UVic (Outside Member)

External Examiner:
Dr. Carsten Krauss, Department of Physics, University of Alberta

Chair of Oral Examination:
Dr. Maycira Costa, Department of Geography, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

The ATLAS Experiment at the CERN Large Hadron Collider is a particle physics experiment to study fundamental particles and their interactions at very high energies. Supersymmetry is a theory of new physics beyond the Standard Model of particle physics. A search for directly produced pairs of the supersymmetric partner of the top quark was performed using 20 fb^{-1} of proton–proton collision data at $\sqrt{s} = 8\ \mathrm{TeV}$ taken in 2012. The search targeted a model where the supersymmetric partner of the top quark (“scalar top”) decays via the supersymmetric partner of the tau lepton (“scalar tau”) into the supersymmetric partner of the graviton (“gravitino”). Scalar top candidates were searched for in pp collision events with either two hadronically decaying taus, two light leptons (electrons or muons), or one hadronically decaying tau and one light lepton. The numbers of events passing the analysis selection criteria agree with the Standard Model expectations. Exclusion limits at the 95% confidence level were set as a function of the scalar top and scalar tau masses. Depending on the scalar tau mass, ranging from the 87 GeV limit set by the LEP experiments to a few GeV below the scalar top mass, lower limits between 490 GeV and 650 GeV were placed on the scalar top mass within the model considered.