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

of

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MSc (University of Victoria, 2012)
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“Measurement of Neutral Current Drell-Yan Production at 8 TeV
with the ATLAS Detector”

Department of Physics and Astronomy

Thursday, August 3, 2017
10:00 A.M.
David Turpin Building
Room A144

Supervisory Committee:
Dr. Richard Keeler, Department of Physics and Astronomy, University of Victoria (Supervisor)
Dr. Robert McPherson, Department of Physics and Astronomy, UVic (Member)
Dr. Robert Kowalewski, Department of Physics and Astronomy, UVic (Member)
Dr. Cornelia Bohne, Department of Chemistry, UVic (Non Unit Member)

External Examiner:
Dr. Kenneth Ragan, Department of Physics, McGill University

Chair of Oral Examination:
Dr. Terri Lacourse, Department of Biology, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies
Abstract

Neutral current Drell-Yan production, $q\bar{q} \rightarrow Z/\gamma^* \rightarrow e^-e^+$, in proton-proton collisions at the LHC was studied with the ATLAS detector. The 20.1 fb$^{-1}$ data set used in this precision measurement was collected in 2012 during which the LHC collided protons at a centre-of-mass energy of 8 TeV. The production rate or differential cross-section was measured in three-dimensions: invariant mass $M_{ee}$, absolute rapidity $|y_{ee}|$, and cosine of the polar angle $\theta^*$ in the Collins-Soper frame. A measurement of the forward-backward asymmetry $A_{FB}$ was obtained from the differential cross-section by summing over the $\cos \theta^* > 0$ (forward) and $\cos \theta^* < 0$ (backward) events and taking their difference. The three-dimensional differential cross-section measurement presented in this dissertation can be used to constrain the $M_{ee}$- and $|y_{ee}|$-dependent parton distribution functions of the proton and the results can be used to extract a measurement of the weak mixing angle $\theta_W$. 