Notice of the Final Oral Examination
for the Degree of Master of Science

of

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BSc (University of Victoria, 2014)

"The Performance of the ATLAS Missing Transverse Momentum High-Level Trigger in
2015 pp Collisions at 13TeV"

Department of Physics and Astronomy

Thursday, September 1, 2016
10:00 A.M.
Elliott Building
Room 160

Supervisory Committee:
Dr. Robert Kowalewski, Department of Physics and Astronomy, University of Victoria (Supervisor)
Dr. Randall Sobie, Department of Physics and Astronomy, UVic (Member)

External Examiner:
Dr. Peter Driessen, Department of Electrical and Computer Engineering, UVic

Chair of Oral Examination:
Dr. Laurence Coogan, School of Earth and Ocean Sciences, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

The performance of the ATLAS missing transverse momentum (E_T^{miss}) high-level trigger during 2015 operation is presented. In 2015, the Large Hadron Collider operated at a higher centre-of-mass energy and shorter bunch spacing $(\sqrt{s} = 13\,\mathrm{TeV}$ and 25 ns, respectively) than in previous operation. In future operation, the Large Hadron Collider will operate at even higher instantaneous luminosity $(\mathcal{O}(10^{34}\,\mathrm{cm}^{-2}\,\mathrm{s}^{-1}))$ and produce a higher average number of interactions per bunch crossing, $\langle\mu\rangle$. These operating conditions will pose significant challenges to the (E_T^{miss}) T trigger efficiency and rate. An overview of the new algorithms implemented to address these challenges, and of the existing algorithms is given. An integrated luminosity of $1.4\,\mathrm{fb}^{-1}$ with $\langle\mu\rangle = 14$ was collected from pp collisions of the Large Hadron Collider by the ATLAS detector during October and November 2015 and was used to study the efficiency, correlation with offline reconstruction, and rates of the trigger algorithms. The performance was found to be satisfactory. From these studies, recommendations for future operating specifications of the trigger were made.