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

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BSc (Pacific University, 2017)

“Results of the 2018 ATLAS sTGC Test Beam and Internal Strip Alignment of sTGC Detectors”

Department of Physics and Astronomy

Wednesday, June 26, 2019
2:00 P.M.
Elliott Building
Room 162

Supervisory Committee:
Dr. Isabel Trigger, Department of Physics and Astronomy, University of Victoria (Co-Supervisor)
Dr. Robert Kowalewski, Department of Physics and Astronomy, UVic (Co-Supervisor)
Dr. Richard Keeler, Department of Physics and Astronomy, UVic (Member)

External Examiner:
Dr. Scott McIndoe, Department of Chemistry, UVic

Chair of Oral Examination:
Dr. Chris Upton, Department of Biochemistry and Microbiology, UVic

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

Over the course of the next ten years, the LHC will undergo upgrades that will more than triple its current luminosity. This increase in luminosity will put greater demands on the ATLAS trigger system. To meet these demands, the Small Wheels of the muon spectrometer will be replaced with the New Small Wheels (NSWs) during Long Shutdown 2. The NSWs employ two gaseous detector technologies — smallstrip Thin Gap Chambers (sTGCs) and Micromegas. To characterize the sTGCs, a series of test beams were conducted on a production sTGC module at the H8 beamline of CERN’s Super Proton Synchrotron. The setup and results of the test beams are presented, and it has been found that the detector meets the performance requirements of the NSW for efficiency and multiplicity at several operating voltages.

To meet the performance requirements of the NSW, the positions of the detector elements must be precisely known. Quality control measurements were made during construction of the sTGC strip cathode boards to allow for the reconstruction of individual strip positions. A transformation from the nominal strip geometry to the as-built geometry is derived based on the QC measurements. This transformation was tested against microscope and cosmic ray misalignment measurements. The as-built predictions agree well with the misalignment measurements, demonstrating the ability to reconstruct the strip positions from the QC measurements.