



**University
of Victoria**

Graduate Studies

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

of

RYAN PORTER

BSc (University of Victoria, 2013)

“An Electronic Model of the ATLAS Phase-1 Upgrade Hadronic Endcap
Calorimeter Front End Crate Baseplane”

Department of Physics and Astronomy

Friday, July 17, 2015

10:00 A.M.

Elliott Building

Room 105

Supervisory Committee:

Dr. Richard Keeler, Department of Physics and Astronomy, University of Victoria (Supervisor)

Dr. Randall Sobie, Department of Physics and Astronomy, UVic (Member)

Dr. Robert McPherson, Department of Physics and Astronomy, UVic (Member)

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Dr. Ben Koop, Department of Biology, UVic

Abstract

This thesis presents an electrical model of two pairs of interconnects of the ATLAS Phase-1 Upgrade Hadronic Endcap Front End Crate prototype baseplane. Stripline transmission lines of the baseplane are modeled using Keysight Technologies' Electromagnetic Professional's (EMPro) 3D electromagnetic simulation (Finite Element Method) and the connectors are modeled using built-in models in Keysight Technologies' Advanced Design System (ADS). The model is compared in both the time and frequency domain to measured Time Domain Reflectometer (TDR) traces and S-parameters. The S-parameters of the model are found to be within 5% of the measured S-parameters for transmission and reflection, and range from 25% below to 100% above for forward and backward crosstalk. To make comparisons with measurements, the cables used to connect the prototype HEC baseplane to the measurement system had to be included in the model. Plots of the S-parameters of a model without these cables are presented for one pair of interconnects for which the crosstalk is expected to be the higher than most other interconnects of the baseplane.