



**University
of Victoria**

Graduate Studies

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

of

NICHOLAS BRUCE

BEng (University of Victoria, 2016)

“Development of a Phased-Array Ionospheric Imaging System”

Department of Mechanical Engineering

Monday, April 1, 2019
10:00 A.M.
Engineering Office Wing
Room 230

Supervisory Committee:

Dr. Aaron Gulliver, Department of Mechanical Engineering, University of Victoria (Co-Supervisor)
Dr. Peter Driessen, Department of Electrical and Computer Engineering, UVic (Co-Supervisor)

External Examiner:

Dr. Aaron Gulliver, Department of Electrical and Computer Engineering, UVic

Chair of Oral Examination:

Dr. Graham McDonough, Department of Curriculum and Instruction, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

A novel approach to ionospheric imaging with the purpose of weather/disaster prediction and climate study is introduced. This feasibility study combines traditional material imaging techniques with high frequency (HF) radio via SDR (software defined radio) systems in order to capture three-dimensional images of the atmosphere. The experimental results show these three-dimensional images as well as a novel approach to measuring ionospheric height. The novelty of the research comes from the use of a closely spaced phased-array of radio antennas being used in conjunction with a post-correlation beamformer repurposed from its place in radio astronomy. Experiments were run at both the University of Victoria and DRAO (Dominion Radio Astrophysical Observatory), the results of which lead to a successful proposal for extending the research onto a larger array with support from research groups in New Mexico.