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

of

JORDAN MYSLIK

BSc (University of Toronto, 2008)

“Measurement of Muon Antineutrino Disappearance in the T2K
Experiment”

Department of Physics and Astronomy

Tuesday, June 7, 2016
12:00 P.M.
Elliott Building
Room 105

Supervisory Committee:
Dr. Dean Karlen, Department of Physics and Astronomy, University of Victoria (Supervisor)
Dr. J. Michael Roney, Department of Physics and Astronomy, UVic (Member)
Dr. Henning Struchtrup, Department of Mechanical Engineering, UVic (Outside Member)

External Examiner:
Dr. David Hanna, Department of Physics, McGill University

Chair of Oral Examination:
Dr. Adam Monahan, School of Earth and Ocean Sciences, UVic

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

The T2K ("Tokai-to-Kamioka") Experiment is a long-baseline neutrino oscillation experiment. A beam of primarily muon neutrinos (in neutrino beam mode) or antineutrinos (in antineutrino beam mode) is produced at the J-PARC ("Japan Proton Accelerator Research Complex") facility. The near detector (ND280), located 280 m from the proton beam target, measures a large event rate of neutrino interactions in the unoscillated beam, while the far detector, Super-Kamiokande, 295 km away, searches for the signatures of neutrino oscillation. This dissertation describes the analyses of data at ND280 and Super-Kamiokande leading to T2K’s first results from running in antineutrino beam mode: a measurement of muon antineutrino disappearance. The measured values of the antineutrino oscillation parameters (Normal Hierarchy) are

\[
(\sin^2(\theta_{23}), |\Delta m^2_{32}|) = (0.450, 2.518 \times 10^{-3} \text{eV}^2/c^4), \quad \text{with 90\% 1D confidence intervals}
\]

\[
0.327 < \sin^2(\theta_{23}) < 0.692 \quad \text{and} \quad 2.03 \times 10^{-3} \text{eV}^2/c^4 < |\Delta m^2_{32}| < 2.92 \times 10^{-3} \text{eV}^2/c^4.
\]

These results are consistent with past measurements of these parameters by other experiments, and with T2K’s past measurements of muon neutrinos.