

Ph.D. Defence
Marc Bergevin

DATE: Monday, December 6
PLACE: Room 222, MacNaughton Building
University of Guelph
TIME: 10:30 a.m.

**THESIS TITLE: SEARCH FOR NEUTRON ANTI-NEUTRON
OSCILLATION AT THE SUDBURYNEUTRINO OBSERVATORY**

Advisor:
Professor Jimmy Law
Dr. Alan W. P. Poon

ABSTRACT

Baryon violating processes are expected in order to explain the baryon asymmetry of the universe. In this thesis, a limit on the neutron anti-neutron ($n\bar{n}$) baryon violating process ($\Delta(B-L) = 2$) is given for part of the data of the SNO experiment; data is sampled from the three phases of the SNO experiment to construct a three-phase blind analysis. The profile likelihood method is used to evaluate a lower limit on the three-phase open data set of SNO giving a free oscillation lifetime for deuteron of $\tau_{n\bar{n}} > 1.18 \times 10^8$ sec (bounded) and $\tau_{n\bar{n}} > 1.96 \times 10^8$ sec (unbounded) at 90% CL for 326.4 days of detector live time. This free oscillation lifetime include nuclear information (a suppression rate of $T_R = 0.248 \times 10^{23} \text{ sec}^{-1}$) in order to compare to experiment that use other nuclear targets; it also includes the systematic errors on both the atmospheric neutrino backgrounds and the detection efficiency of the $n\bar{n}$ signal. This result is comparable to the Soudan-II result of $\tau_{n\bar{n}} > 1.3 \times 10^8$ sec at 90% CL; it is expected that the full analyses will improve the SNO result by approximately a factor of 2 which will give a lower limit comparable to the Super-Kamiokande result of $\tau_{n\bar{n}} > 2.36 \times 10^8$ sec (bounded) at 90% CL.

EXAMINING COMMITTEE:

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