Canadian Association of Physicists Association canadienne des physiciens et physiciennes

Contribution ID: **1654** Type: **CLOSED - Oral (Student, In Competition) / Orale (Étudiant(e), inscrit à la compétition)**

Detecting Antineutrinos Using the SNO+ Detector

Wednesday 31 May 2017 11:30 (15 minutes)

The neutrino is an incredibly small and light particle that rarely interacts with any materials: 10 billion cosmic neutrinos pass through each square centimetre of Earth every second with no effect. This makes them extremely difficult to study. As a result, experiments designed to detect neutrinos must be very large.

Following upgrades to the Nobel Prize-winning SNO (Sudbury Neutrino Observatory) detector, the SNO+ detector aims to accomplish this challenging task. Located 2 kilometres underground in Sudbury, Ontario, the SNO+ detector is an acrylic sphere, 12 metres in diameter, filled with a kilotonne of liquid scintillator (fluid that gives off a measurable light signal when struck by radiation).

The primary goal of the SNO+ experiment is to look for a very rare form of radioactive decay (neutrinoless double beta decay) to see if the neutrino can be the first particle known to also be its own antiparticle. This large-scale liquid scintillator detector will also be used for a number of other measurements–one such measurement is the detection of antineutrinos.

Antineutrinos–produced in large quantities from nearby nuclear reactors–will interact in the detector through the inverse beta decay (IBD) reaction. Along the way to the detector, some of these antineutrinos will oscillate, escaping detection. Due to its geographical proximity to these reactors, SNO+ is very well suited to measure the parameters that govern this neutrino oscillation.

We have used Monte Carlo simulations to show what the IBD signal from antineutrinos will look like in the SNO+ detector. We have also developed techniques that will distinguish this signal from naturally occurring radioactive backgrounds. The next step is to implement this antineutrino search while the detector is filled with water (the current intermediate phase before scintillator is added).

By performing the search in the water phase of the experiment, we will further develop the efficacy of the tools necessary to sift through the detector data for this rare signal. This also enables us to identify and evaluate possible backgrounds that could mask IBD interactions. Following this, we will be well positioned to measure antineutrino signals once the detector is fully commissioned.

Author: MEKARSKI, Pawel (University of Alberta)

Presenter: MEKARSKI, Pawel (University of Alberta)

Session Classification: W2-3 Neutrino Physics (PPD) | Physique des neutrinos (PPD)

Track Classification: Particle Physics / Physique des particules (PPD)