Canadian Association of Physicists
Association canadienne des physiciens et physiciennes

Contribution ID: **3324** Type: **Poster Competition (Graduate Student) / Compétition affiches (Étudiant(e) 2e ou 3e cycle)**

(G*) (POS-30) Muon Veto System for Mini-HALO Neutrino Detector

Tuesday, 7 June 2022 17:36 (2 minutes)

The proposed neutrino detector HALO-1kT will be used to detect neutrinos from core-collapse supernova events and will contribute to our understanding of the stars'explosion mechanism. Its detection method is based on neutrinos interacting with lead nuclei which then emit neutrons that can be detected through helium counters. However, neutrino-lead cross sections at supernova energy scale are yet to be accurately measured. To help address this problem, a smaller scale prototype detector called Mini-HALO will be placed at Oak Ridge National Laboratory where a pulsed beam of neutrinos from the Spallation Neutron Source will interact with the lead in the detector producing neutrons. The measured cross-sections will then be used in HALO-1kT to constrain the number of neutrons we expect from a supernova signal. In order to obtain highly accurate measurements, a muon veto system will be installed on Mini-HALO to veto events induced by cosmic muons interacting in the detector that can be otherwise misidentified as signals from neutrino interactions. A suit of GEANT4 Monte Carlo simulations has been developed to study and build an optimized geometry of the muon veto system. These simulations consist of PVT polymer-based scintillator panels surrounding the detector which generate optical photons when traversed by high energy muons. Results from these simulations such as the energy deposited in the scintillator panels, the multiplicity of neutrons produced in muon-lead interactions in the detector, and detector dead-time will be addressed along with discussions on how these results can be used to veto the muon-induced signals in the detector.

Primary author: SAJID, Shayaan

Presenter: SAJID, Shayaan

Session Classification: PPD Poster Session & Student Poster Competition (21) | Session d'affiches PPD et concours d'affiches étudiantes (21)

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