P2.039 Measurements of neutrino-induced neutron production processes by the COHERENT collaboration

G Rich[1] and P Barbeau[2]

[1]Triangle Universities Nuclear Lab, USA, [2]Duke University, USA

on behalf of COHERENT collaboration

The process of neutrino-induced neutron production is theorized to play a role in nucleosynthesis and is the fundamental mechanism by which the HALO supernova neutrino detector is intended to function; despite the astrophysical implications of this process, there is no experimental input to constrain theoretical predictions which vary by a factor of ~3. Neutrino-induced neutrons (NINs) will also serve as a background for the efforts of the COHERENT collaboration towards making an observation of coherent elastic neutrino-nucleus scattering (CEvNS) at the Spallation Neutron Source (SNS). Neutrinos from the SNS incident on shielding material near the CEvNS detectors could produce neutrons that would give rise to interactions approximating both the signal characteristics and the timing signature expected from CEvNS interactions. COHERENT intends to measure inclusive cross sections for neutrino production on lead, iron, and copper, using several modular shielding structures, called "neutrino cubes", that will house liquid scintillator cells surrounded by the NIN target material. Three neutrino cubes have been installed in the experimental area in use by the COHERENT collaboration, providing modest overburden of ~8 m.w.e. and a distance to the SNS target of ~20 m. Customsized scintillator cells have been characterized using neutron beams available at Triangle Universities Nuclear Laboratory, and data collection began in January 2016 for measurement of the NIN process on the ~900-kg Pb target installed in one of the cubes. Additionally, a measurement was carried out using liquid scintillator cells placed inside a shielding structure located where the CsI[Na] CEvNS detector is presently collecting data, allowing an in situ determination of the NIN background contribution. Results of simulations and preliminary experimental analyses will be discussed, along with implications for backgrounds in the COHERENT campaign