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Current status of ANNIE and outlook for the second phase of the experiment

Thursday, 8 June 2017 18:00 (2 hours)

The primary physics goal of the Accelerator Neutrino Neutron Interaction Experiment (ANNIE) is to use gadolinium-doped water to measure the neutron yield from neutrino-nucleus interactions. ANNIE's studies of neutron yield will lead to reduced systematic uncertainties in oscillation searches and cross-section studies. They will also improve the power of background rejection techniques that use neutron tagging, whether from a capture on gadolinium as in ANNIE, or a capture on hydrogen as planned for the Hyper Kamiokande detector. Detection of supernova neutrinos and nucleon decay searches, an important test of the predictions of Grand Unification Theories, are examples of where one can reject dominant backgrounds using neutron tagging. The ANNIE detector consists of an interaction volume of around 30 tons of pure water, loaded with gadolinium, sitting on the Booster Neutrino Beam at Fermilab. Surrounding the interaction volume, photodetectors will collect Cherenkov light from the primary particles produced in neutrino interactions and the 8 MeV photons from neutron captures. A crucial part of the detector design is that, in addition to photomultiplier tubes, we will house the first live test of prototype Large Area Picosecond Photodetectors, whose picosecond timing resolution will enhance our ability to reconstruct the interaction vertex. We will present an overview of the first phase, which was devoted to the characterisation of backgrounds, and plans for the second phase, where we expect physics data next year.

Primary author: BACK, Ashley (Iowa State University)

Presenter: BACK, Ashley (Iowa State University)

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