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The Atmospheric Neutrino Neutron Experiment (ANNIE)

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Neutron tagging in Gadolinium-doped water may play a significant role in reducing backgrounds from atmospheric neutrinos in next generation proton-decay searches using megaton-scale Water Cherenkov detectors. Similar techniques might also be useful in the detection of supernova neutrinos. Accurate determination of neutron tagging efficiencies will require a detailed understanding of the number of neutrons produced by neutrino interactions in water as a function of momentum transferred. We are developing a proposal for an experiment to be built on the Fermilab Booster Neutrino Beam, the Atmospheric Neutrino Neutron Interaction Experiment (ANNIE), which is designed to measure the neutron yield of atmospheric neutrino interactions in gadolinium-doped water. An innovative aspect of the ANNIE design is the use of precision timing to localize interaction vertices in the small fiducial volume of the detector. We propose to achieve this by using early production of LAPPDs (Large Area Picosecond Photodetectors). This experiment will be a first application of these devices demonstrating their feasibility for Water Cherenkov neutrino detectors. In this talk we will discuss the technological aspects of the ANNIE detector, with particular emphasis on work involved in adapting LAPPDs for the measurement.

Summary

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