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First detection of neutrinos in water-based liquid scintillator at ANNIE

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Water-based liquid scintillator (WbLS) is a novel detector medium that allows for the separation of the scintillation and Cherenkov components of a signal. As such, it is of great interest for the development of future hybrid neutrino detectors, allowing for a low energy-threshold, directional event reconstruction, reconstruction of hadronic recoils, and enhanced particle identification.

The Accelerator Neutrino Neutron Interaction Experiment (ANNIE) is a 26-ton gadolinium-loaded water Cherenkov neutrino detector installed on the Booster Neutrino Beam (BNB) at Fermilab. As its main physics goals the experiment aims to investigate neutrino-nucleus interactions and cross sections. Additionally, ANNIE has an equally important focus on the research and development of new detector technologies, such as WbLS and Large Area Picosecond Photodetectors (LAPPDs).

This talk presents the deployment of a 70cm x 90cm WbLS vessel in ANNIE and the subsequent first detection of neutrinos in WbLS. The successful observation of both scintillation and Cherenkov light in ANNIE corresponds to a proof-of-concept for the hybrid event detection. This allows for the development of reconstruction and particle identification algorithms, as well as dedicated analyses in ANNIE, that make use of both the Cherenkov and scintillation component.

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