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Exploration of Directionality Capabilities with PROSPECT

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The Precision Reactor Oscillation and Spectrum Experiment (PROSPECT) is an above-ground antineutrino experiment at short baselines located at the High Flux Isotope Reactor (HFIR) at Oak Ridge National Laboratory (ORNL). The PROSPECT detector comprises 4-tons of Li-6 doped liquid scintillator (6LiLS) divided into an 11x14 array of optically separated segments. This experiment's physics goals include searching for the existence of sterile neutrinos and precisely measuring the antineutrino energy spectrum. Antineutrinos are detected via the inverse beta decay (IBD) interaction which provides a near-unique space-time correlated signal pair consisting of a positron energy deposition and a delayed neutron capture in the liquid scintillator. The correlation between prompt and delayed pulses/signals is an excellent handle for background suppression. The highly segmented nature of the PROSPECT detector, as well as the double-ended readout structure in each segment, provides good position reconstruction for both prompt and delayed signals. In this talk, I will give an overview of the experiment, as well as current efforts to use the position resolution of the detector and the kinematics of the IBD reaction to study the neutrino directional reconstruction capabilities of PROSPECT.

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