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Final Physics Results from the PROSPECT-I Data Set

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PROSPECT is a reactor antineutrino experiment consisting of a 4-ton liquid scintillator antineutrino detector divided into an 11x14 array of optically separated segments. The detector was designed to probe the existence of sterile neutrino oscillations and precisely measure the antineutrino spectrum resulting from ^{235}U fission. Data was taken in 2018 and 2019 with a first-generation detector called PROSPECT-I located on the Earth's surface roughly 7 m from the 85 MW, compact, highly-enriched High Flux Isotope Reactor (HFIR) at Oak Ridge National Laboratory. This dataset has already had a substantial impact by placing stringent limits on sterile neutrino oscillations at the eV scale, setting new direct limits on boosted dark matter models, providing a precision ^{235}U spectral measurement, and demonstrating unique neutrino detection capabilities. During the data collection period, information coming from a small number of PMTs had to be excluded causing an overall statistical impact on previous results. To recover this otherwise lost information, two new data analysis tools, Data Splitting and Single Ended Event Reconstruction, have been implemented, resulting in a multi-period analysis with significant improvements in event reconstruction capabilities and signal-to-background ratios. This presentation will report the final results for the search for eV scale sterile neutrino oscillations using the PROSPECT-I data set.

Submitted on behalf of a Collaboration?

Yes

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