



Contribution ID: 24

Type: **not specified**

Final Results from the PROSPECT-I Data Set: Spectrum and Oscillation Analyses

Wednesday, 12 July 2023 16:00 (20 minutes)

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 that was 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 known as Data Splitting and Single Ended Event Reconstruction have been implemented resulting in a multi-period analysis with improved antineutrino event selection criteria. This presentation will report the impact of this new analysis effort in the measurement of the ^{235}U spectrum, as well as in the search for sterile neutrino oscillations.

This work is supported by the US DOE Office of High Energy Physics, the Heising-Simons Foundation, CFREF and NSERC of Canada, and internal investments at all institutions.

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Session Classification: Oral contributions