

## Road to PROSPECT-II

The Precision Reactor Oscillation and SPECTrum (PROSPECT) experiment is based in a segmented liquid scintillator antineutrino detector situated approximately 7 meters from the highly enriched High Flux Isotope Reactor (HFIR) at Oak Ridge National Laboratory. Its main goal is to investigate short-baseline antineutrino oscillations.

The first phase of data collection, known as PROSPECT-I, was held from 2018 to 2019 and was used for several high-precision analyses, including multiple measurements of the  $^{235}\text{U}$  antineutrino spectrum and searches for  $eV$ -scale sterile antineutrino oscillations.

The collaboration is now preparing for the second phase, PROSPECT-II, which features an upgraded detector design. This advancement will enhance sensitivity and statistical power, allowing for a broader range of analyses beyond those achieved in PROSPECT-I. As we transition into this new phase, new questions have arisen concerning background simulation and its potential differences from those conducted during the initial phase of the experiment. Moreover, it is essential to ascertain, through simulations, the positive effects that an improved detector could have on the study of oscillations. This information is crucial for justifying the proposed enhancements, and I will present all of this in the poster.

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**Session Classification:** Poster Session