Towards a Precise Measurement of the $^{235}$U Spectrum with PROSPECT
Karsten M. Heeger, Yale University  for the PROSPECT Collaboration

A Segmented Antineutrino Detector

PROSPECT measures $\bar{\nu}_e$ energy spectrum with energy resolution <5%/E in 154 segments at baselines 7-12m from HEU reactor ($^{235}$U) at the High Flux Isotope Reactor (HFIR) at ORNL. ~640 inverse beta decays detected per day.

Understanding the Reactor Antineutrino Spectrum

Daya Bay and other reactor experiments measure anomalous spectrum ("bump") at PWR reactors compared to current models. \cite{DayaBay}

PROSPECT will make high-statistics measurement of HEU spectrum with excellent energy resolution and test reactor models. Understanding detector energy response is critical. \cite{Heeger2016}

Source Calibration of PROSPECT

Individual detector segments calibrated with radioactive and optical sources.

Performance of Detector Segment (P50 Prototype)

Calibration studies of PROSPECT prototype segment \cite{Heeger2018}

Observation of Reactor Antineutrinos at HFIR

First day of reactor antineutrinos at HFIR

First observation of antineutrinos from HFIR at >50 in ~4 hrs.

Radioactive source calibration, cosmogenics, and optical calibration used to characterize response of individual detector segments.

Excellent E resolution <5% at 1 MeV. S/B > 1.3 in first round of analysis.

Stay tuned for more data!

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karsten.heeger@yale.edu  PROSPECT talk: Friday 12:15pm  Neutrino 2018