The PROSPECT antineutrino detector (AD) is in now operating 7-9m from a research reactor core:
• 4 ton 6Li-loaded liquid scintillator (6LiLS) target
• Low mass optical separators provide 154 optical segments, 117.5x14.6x14.6cm³
• Double-ended PMT readout
• Internal calibration access along full segment length

The PROSPECT AD has successfully detected antineutrinos in the high background environment close to a reactor core and on the Earth’s surface.

Stability of Antineutrino Detector Response

In addition to calibration sources, AD data can be used to measure system stability, validating our calibration procedures.

- Time stability of neutron capture efficiency
- Time stability of energy reconstruction

Axial position resolution. Other performance parameters are assessed via a combination of measurements and simulation.

Antineutrino Detector Performance

The AD light yield & PSD performance are very good (poster 146), as is axial position resolution. Other performance parameters are assessed via a combination of measurements and simulation.

- Axial Position Resolution
- Neutron Capture Time
- Antineutrino detection efficiency

Antineutrino Detector Self-Calibration

Segmented PROSPECT AD design and Li-6 and Ac-227 doping provide a wealth of data for position, timing, and response calibrations for all segments and axial positions.

- Response Calibration
- Timing Calibration
- Position Calibration

Background events provide a myriad of ways to measure segments performance – observed segment-to-segment variation is small.

- Optical collection along segment length
- Relative energy scale between segments
- Axial position reconstruction

Signal and Background Characteristics

Prospect has begun to study the characteristics of IBD signal and cosmogenic background events.

- Observation of reactor antineutrinos at the Earth’s surface
- Time variation of cosmogenic backgrounds

Conclusions

- The recently commissioned PROSPECT AD is performing very well
- Detector design features provide multiple observables to calibrate and track system stability and uniformity
- Energy resolution, position resolution and detection efficiency meet expectations
- Antineutrinos have been detected in the high background environment close to a research reactor core and on the Earth’s surface