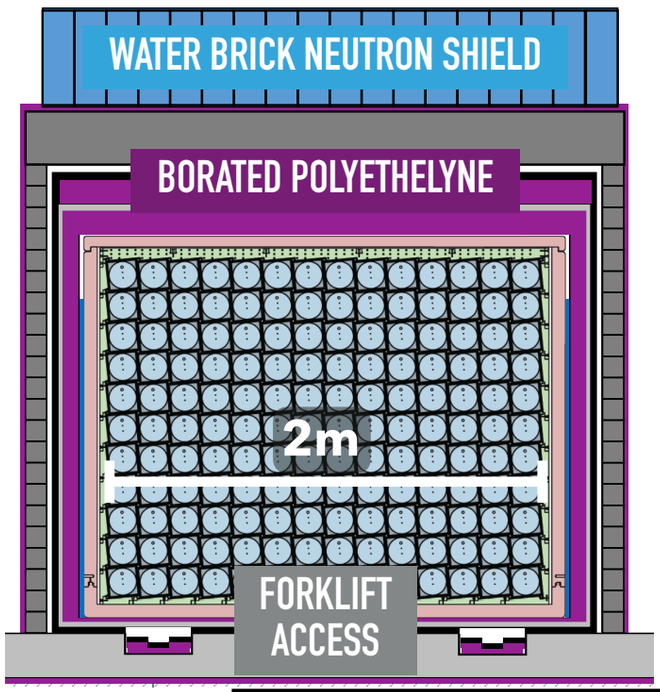
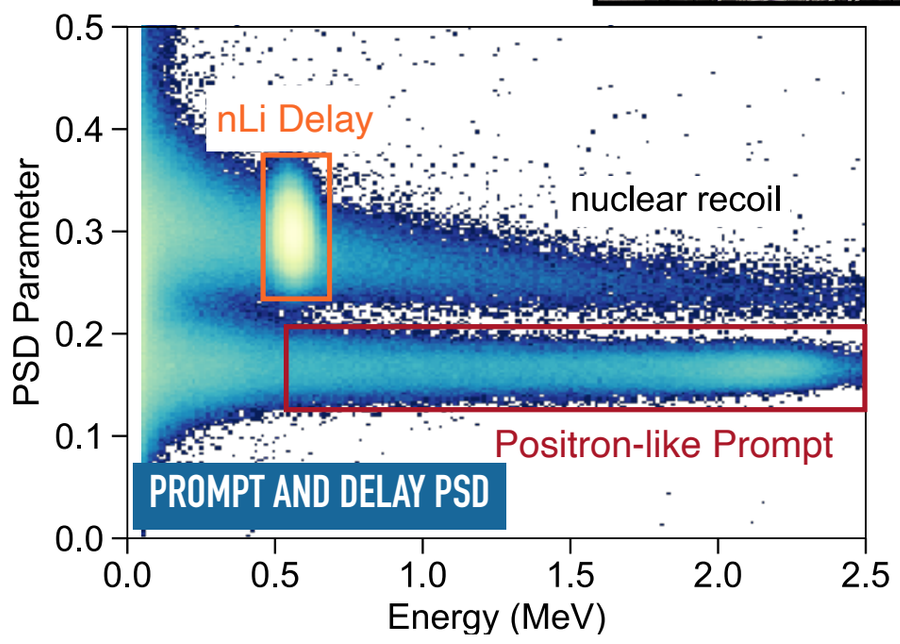
SURFACE-BASED SEGMENTED PSD DETECTOR

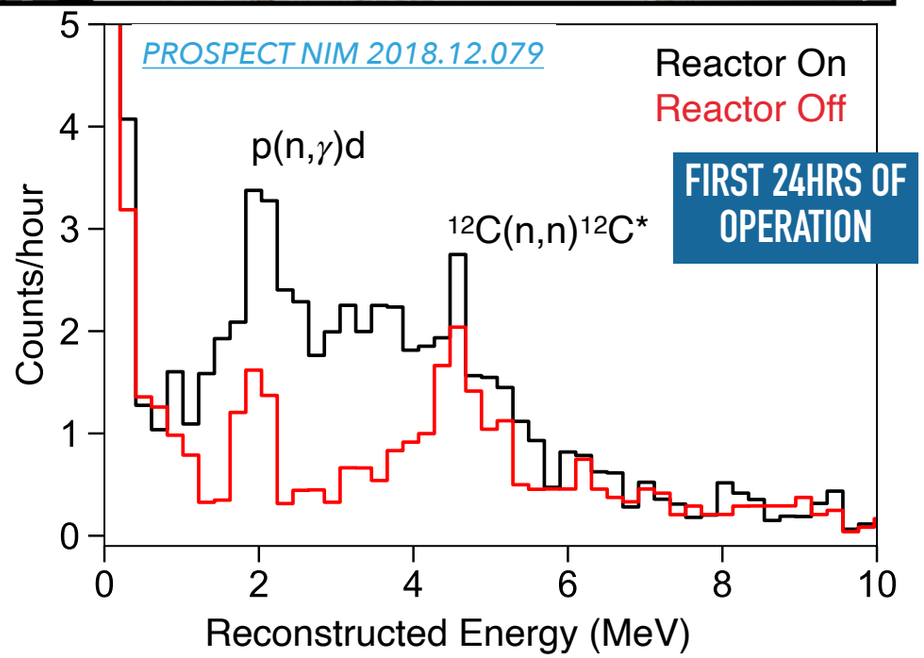
PROSPECT

Room-sized surface-based detector with demonstrated performance at 85MW research reactor

- ^{6}Li-loaded PSD-capable scintillator enables efficient ID of prompt and delayed candidates (currently LS, future PS?)
- 3D position reconstruction from segmentation and double-ended PMT readout
- PSD, Event topology ID, and fiducialization provide >10^4 suppression of backgrounds





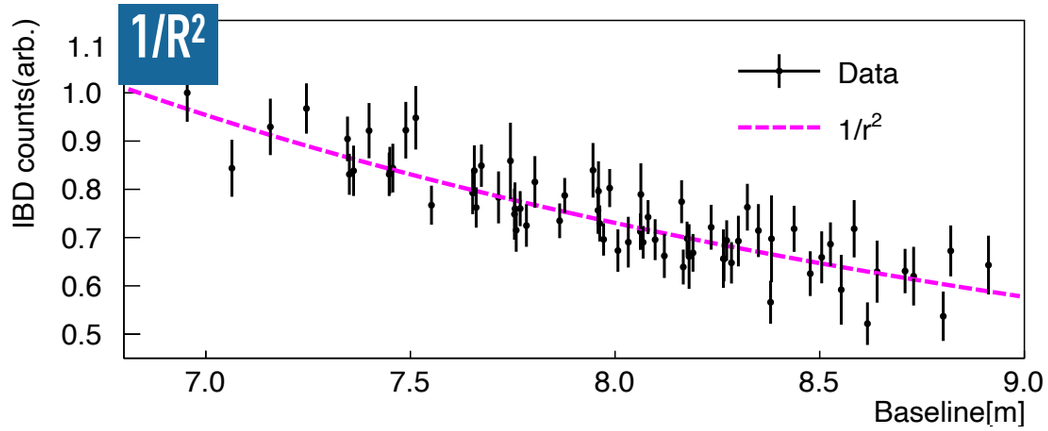


Deployed in 2 weeks and successful observation of IBDs within first hours of operation with no overburden

DEMONSTRATED CAPABILITIES WITH PROSPECT

PROSPECT has made significant first-of-kind demonstrations in the extremely challenging background environment close to a research reactor without overburden

- First high-sensitivity demonstration of aboveground antineutrino detection (S:B> 1:1)
- 1/R² IBD rate verification of reactor location
- IBD-directionality through prompt/delay separation
- ^{235}U spectrum measured with < 5% energy resolution and statistical precision



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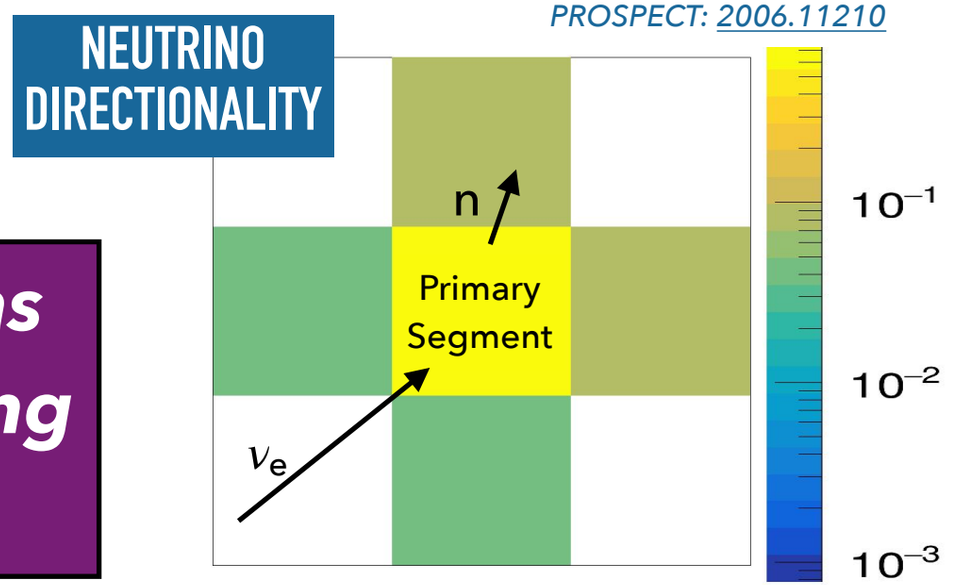


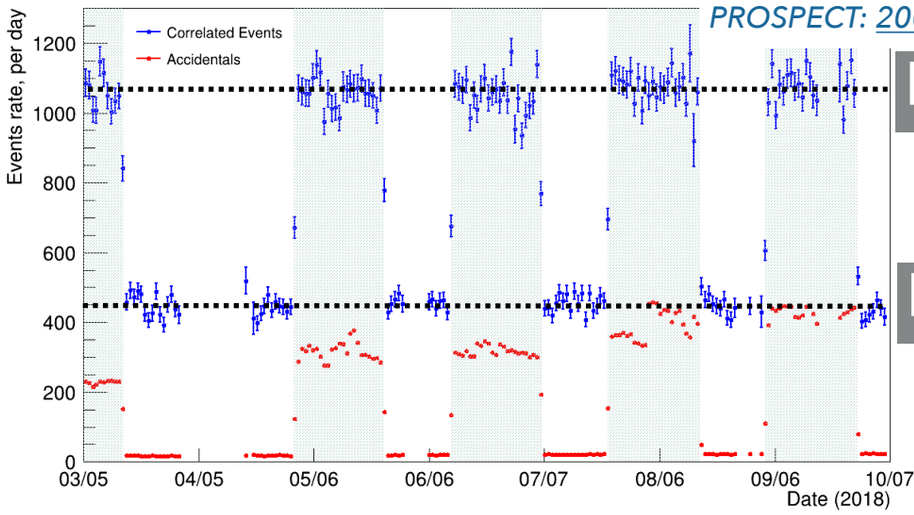
PROSPECT's surface-based demonstrations enable a greater range of reactor monitoring use-cases than was previously possible

USE-CASES ENABLED BY PROSPECT

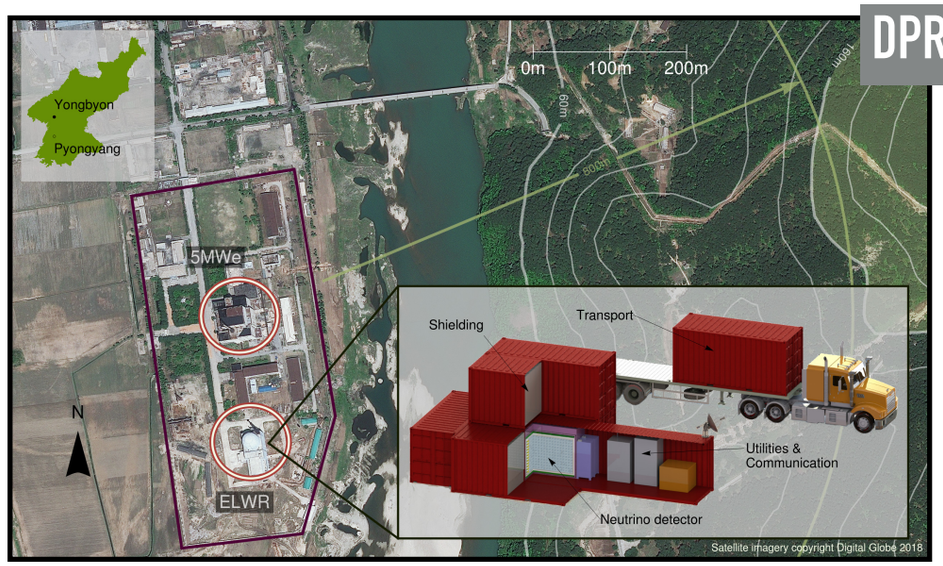
- PROSPECT has verified the operational state, power, and fuel composition of ^{235}U fueled research reactor
  - State and power monitoring comparable to IAEA use of ATPM thermo-hydraulic monitoring system
  - Potential utility for verifying future fissile material treaties
- Assuming further engineering focused on mobility and robustness, PROSPECT can serve as a 'standard' for numerous monitoring use-cases
- Neutrinos on the Korean Peninsula (Science & Global Security, 27:1, 15-28) containerized PROSPECT-like detector with mobile shielding packages, potential for collaboration with DPRK scientists.
- Diversion detection from PWR and fast reactors (Nature Comm (2019)10:3527) with RETINA Concept: set of PROSPECT-like detectors surrounding reactor core

PROSPECT-like detectors offer continuous, non-intrusive capabilities enabling a broad range of potential use cases

PROSPECT: 2006.11210



DPRK



RETINA