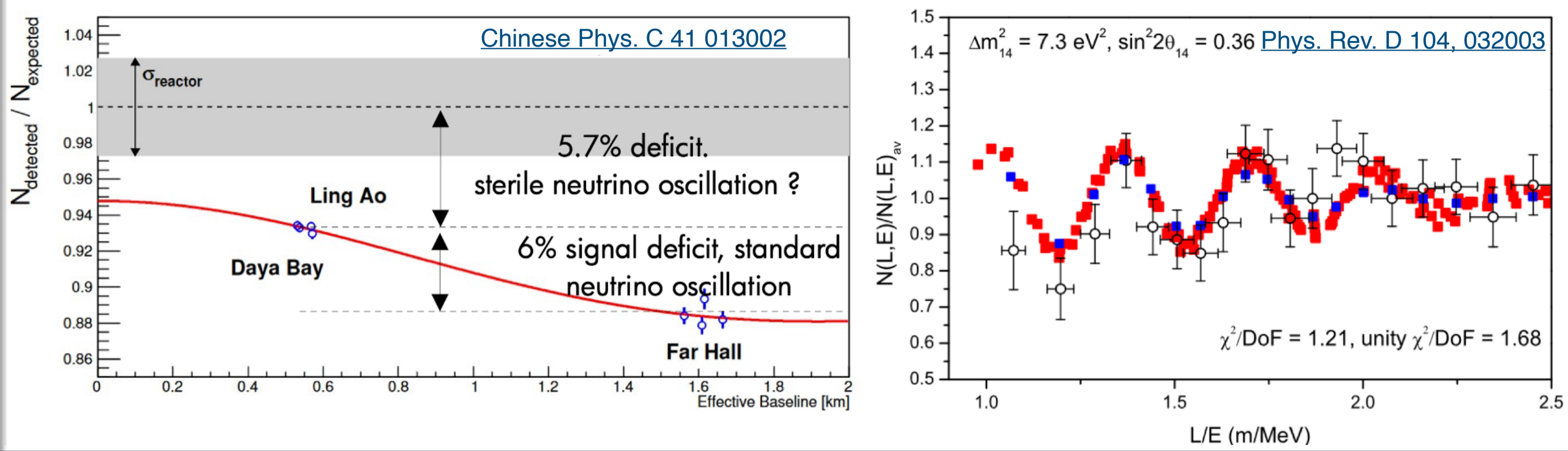


### 1. PROSPECT Motivation: Reactor Antineutrino Anomaly

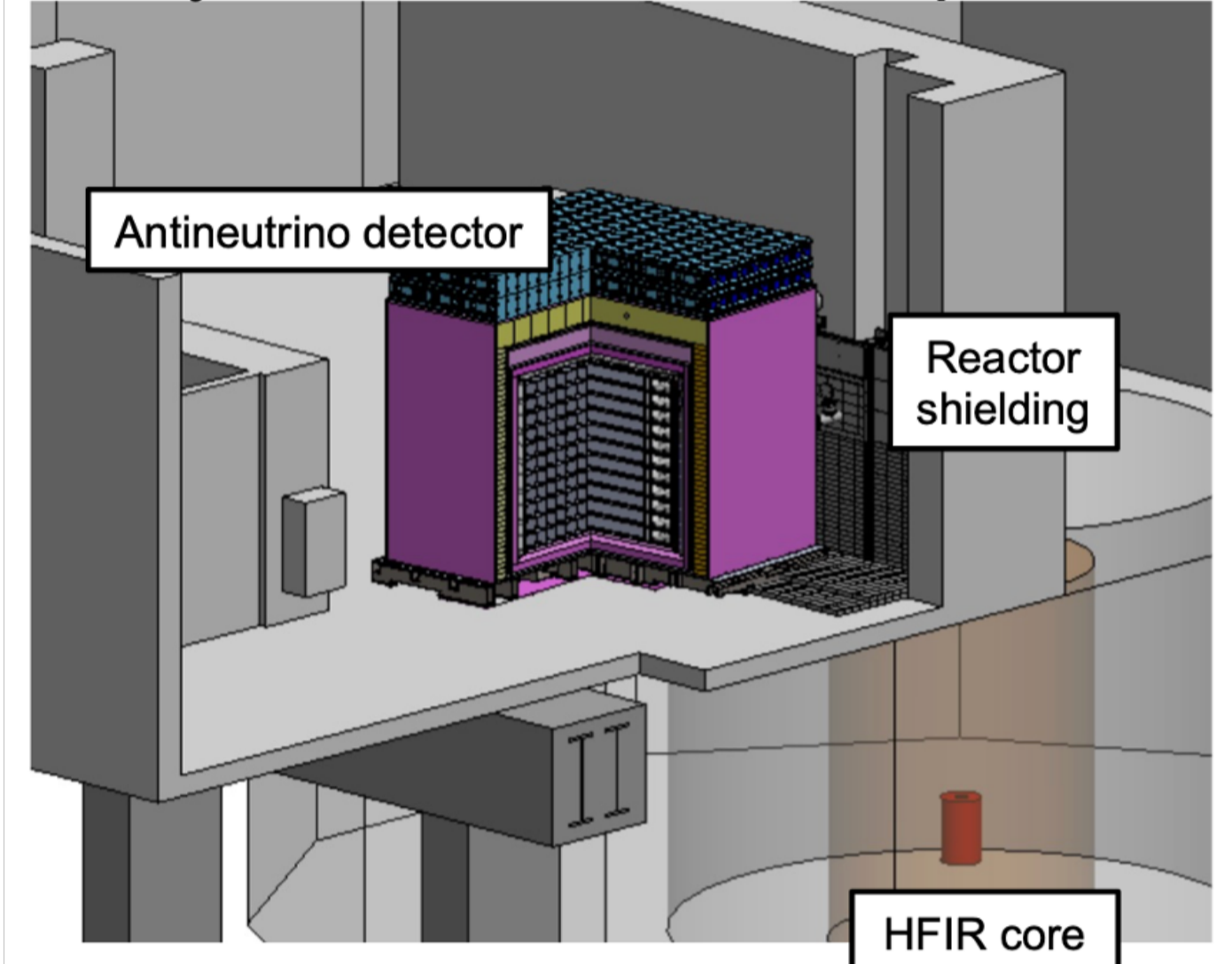
- Antineutrino flux predictions differs from precision measurements
- Possible explanations:
  - Flux mis-prediction
  - Oscillation of active antineutrinos into sterile states



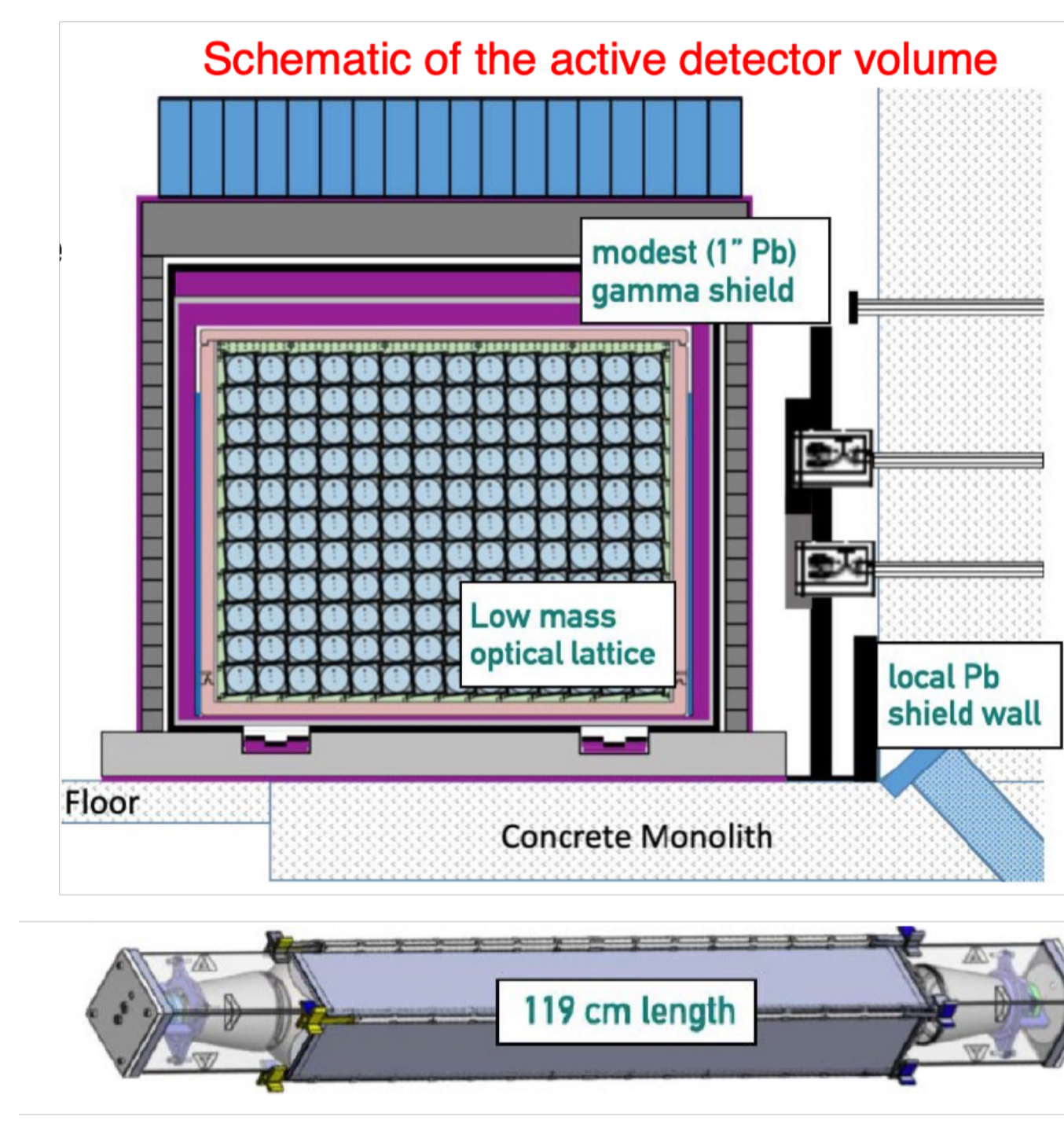
### 2. PROSPECT-I Design

- Reactor on data from Mar - Oct 2018 at HFIR (TN, USA)
- 6.7–9.2m from HFIR

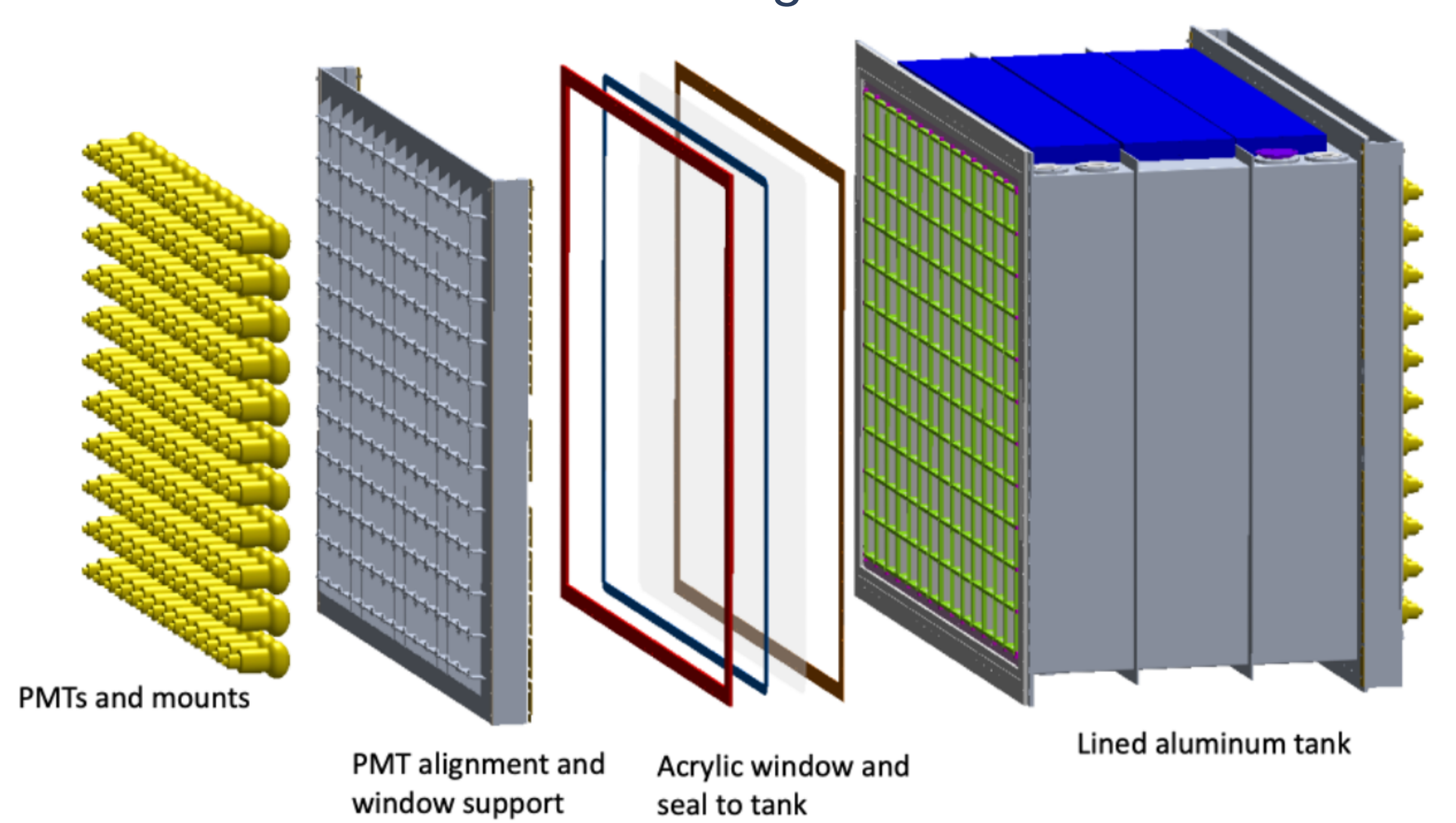
#### Layout of PROSPECT experiment



- 154 segments - 14x11 grid
- Each segment:
  - 2 PMTs
  - Filled with LiLS
  - Pulse Shape Discriminator



### 6. PROSPECT-II Detector Design

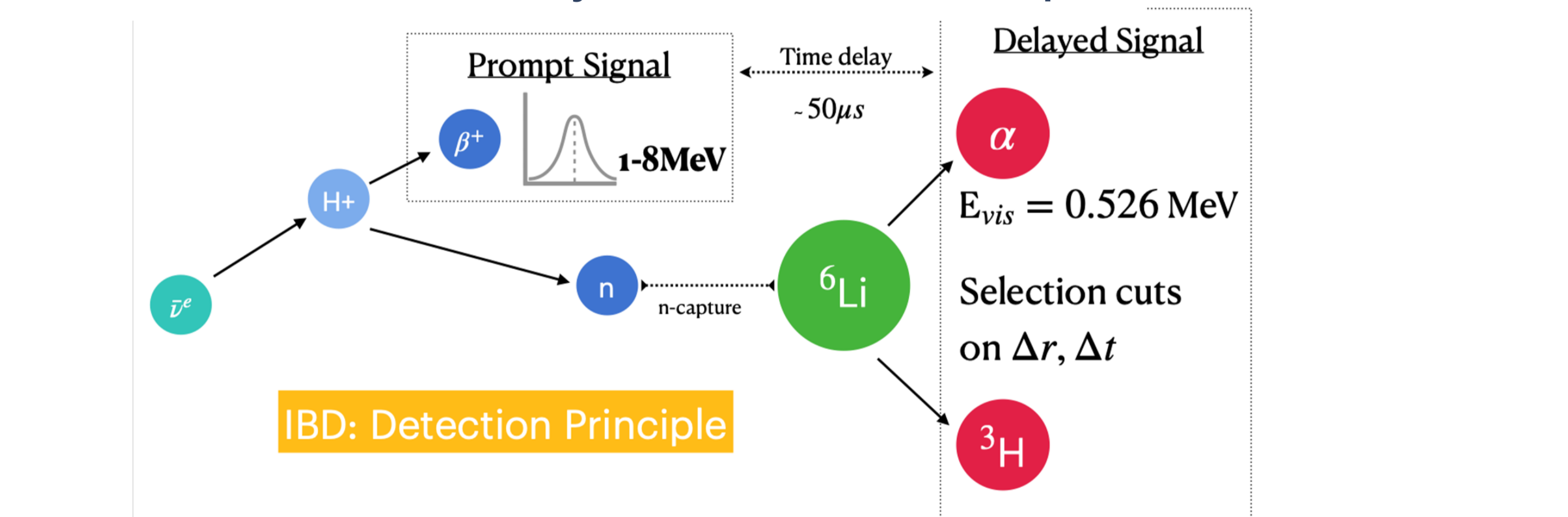


- Re-using PMTs
- PMTs removed from the active volume
- Full acrylic optical interface between the PMTs and LiLS
- New tank teflon lining
- Mineral oil for optical coupling and shielding
- Cabling out of LiLS volume
- LiLS Overflow
- Temperature control system

#### Extended sensitivity in ~2y:

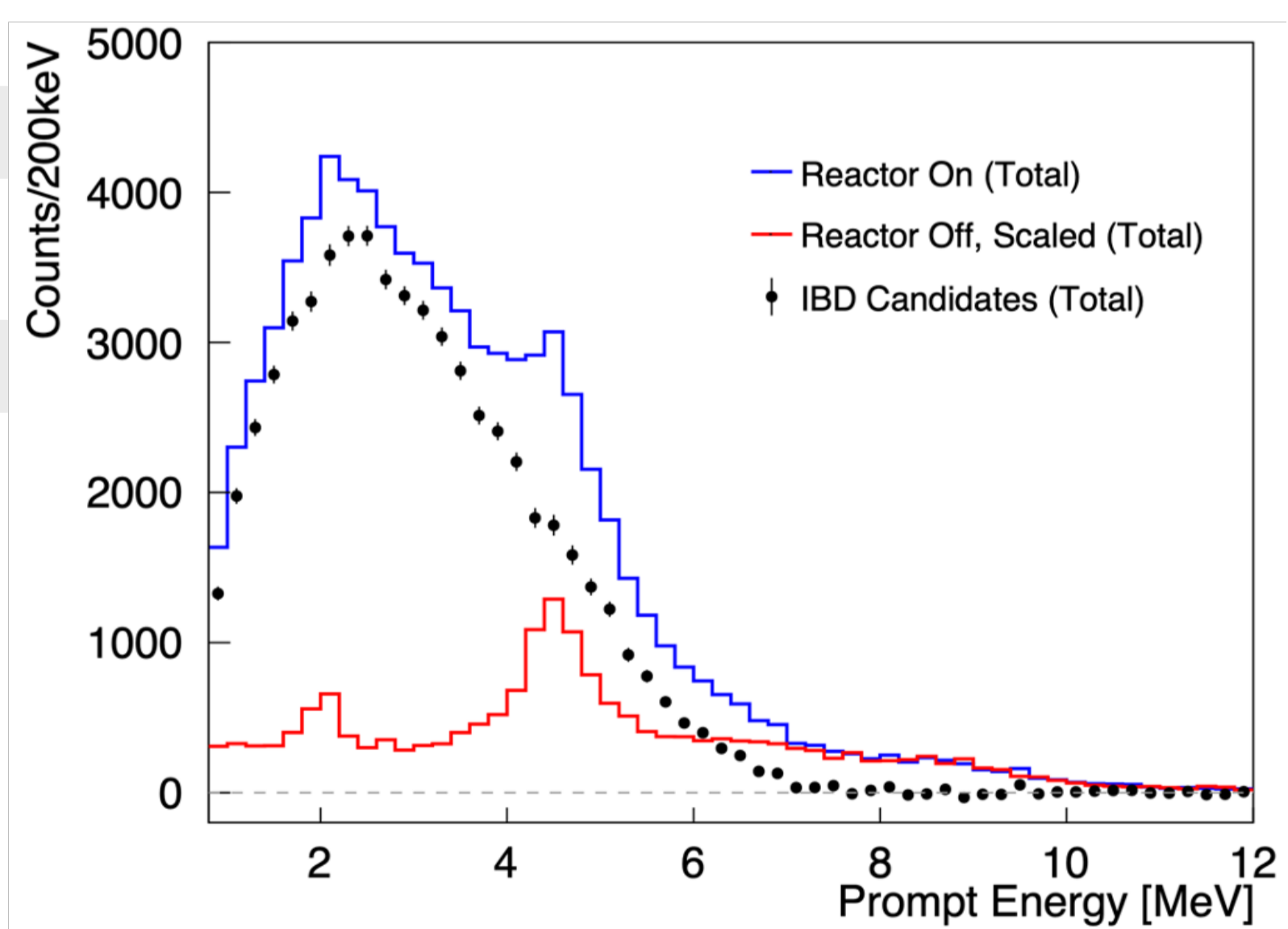
Parameter	P1	P2 at HFIR	P2 at LEU
Effective Statistics	36204	$2.08 \times 10^5$	$1.79 \times 10^6$

### 3. Inverse Beta-Decay Detection Principle



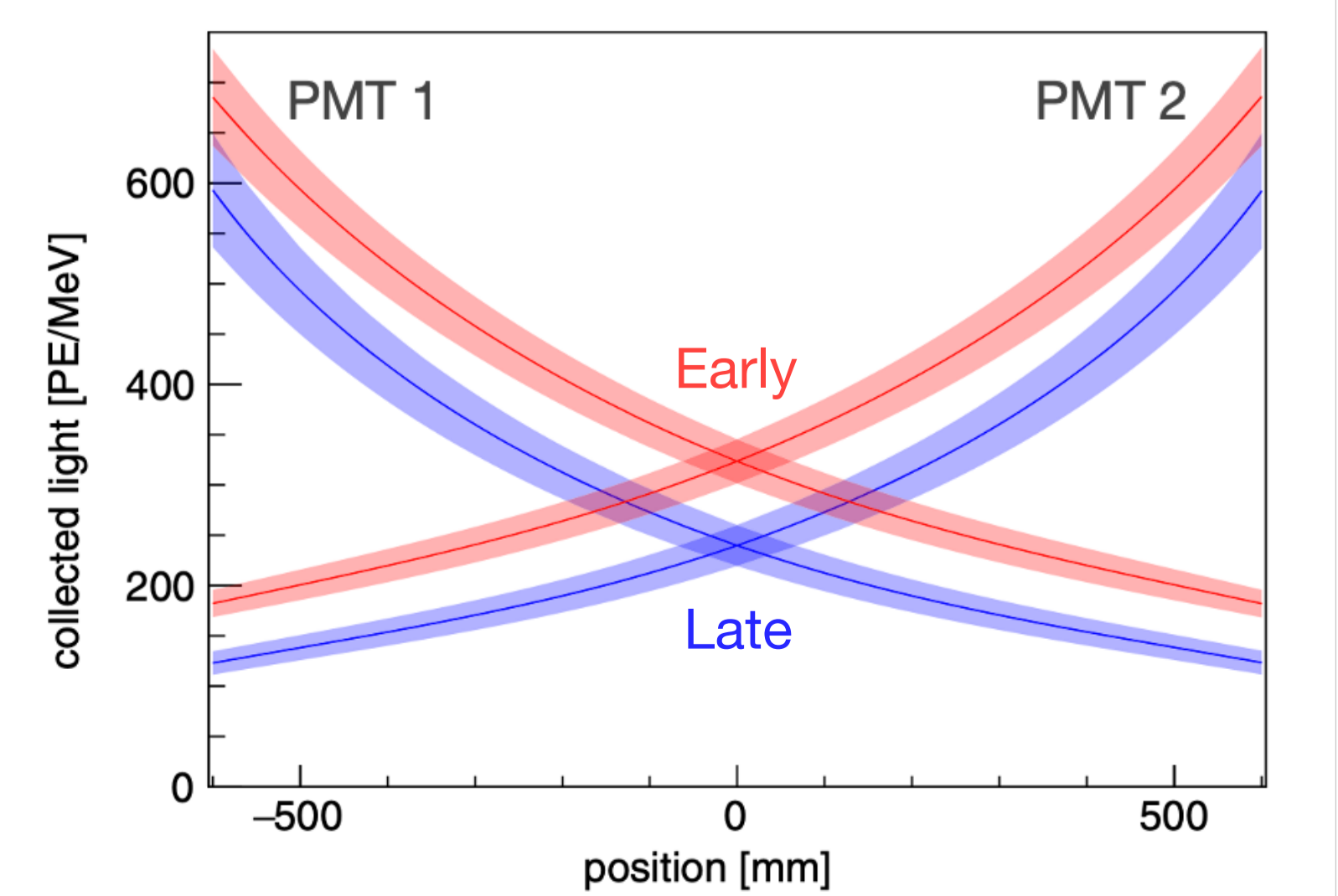
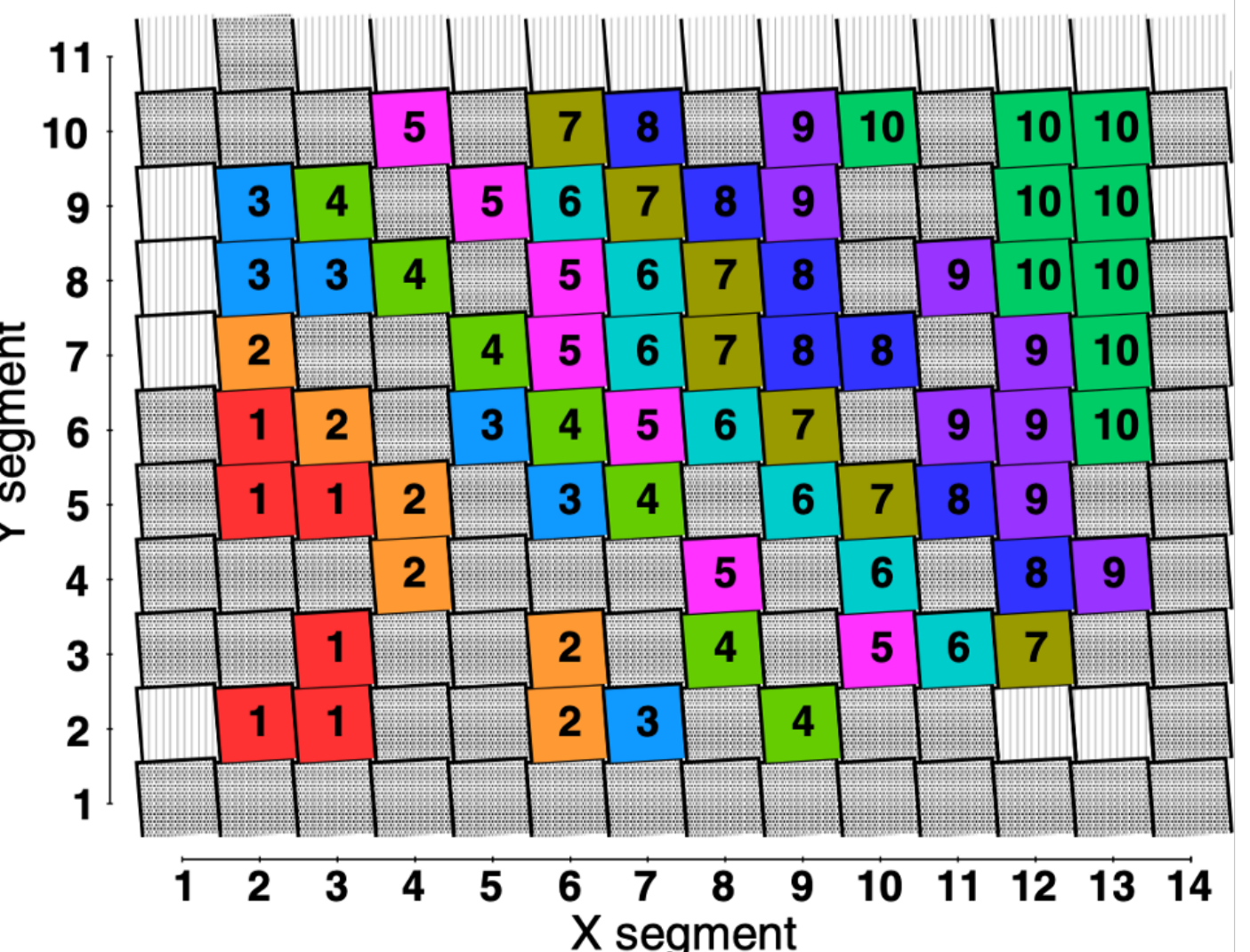
### 4. PROSPECT-I Physics Results

- Great signal to background ratio and energy resolution S:B of 4:1
- Oscillation:
  - No indication of sterile neutrino and rejected RAA best-fit point at  $2.5\sigma$
- Spectrum:
  - Observation of excess at  $\sim 5$  MeV
  - Isotopic composition of 'The Bump':
    - Equal Isotope hypothesis preferred:
    - No  $^{235}\text{U}$  disfavored at  $3.2\sigma$
    - All  $^{235}\text{U}$  disfavored at  $2.2\sigma$



### 5. PROSPECT-I Challenges

- LiLS ingress into PMT housing caused PMT degradation
- LiLS degradation caused effective attenuation length and light yield reduction



### 7. PROSPECT-II Projected Physics Results

- Oscillation:
  - More phase-space coverage, specially at higher  $\Delta m_{41}^2$
  - Addresses Neutrino-4
  - Help us have a clearer picture on the Long-Baseline CP Violation

