

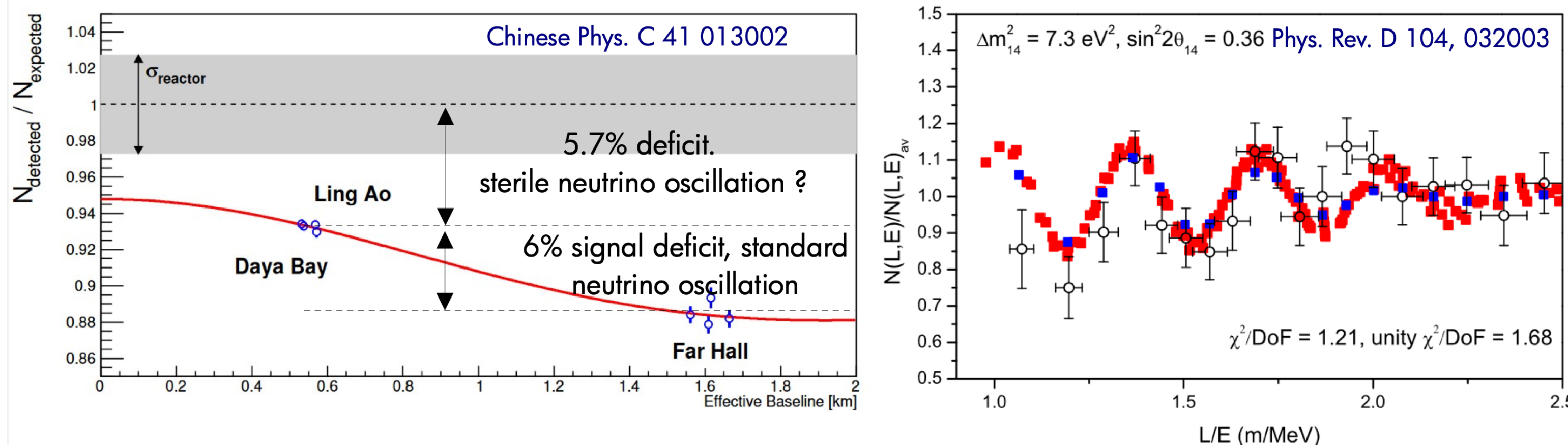
ROAD TO PROSPECT-II

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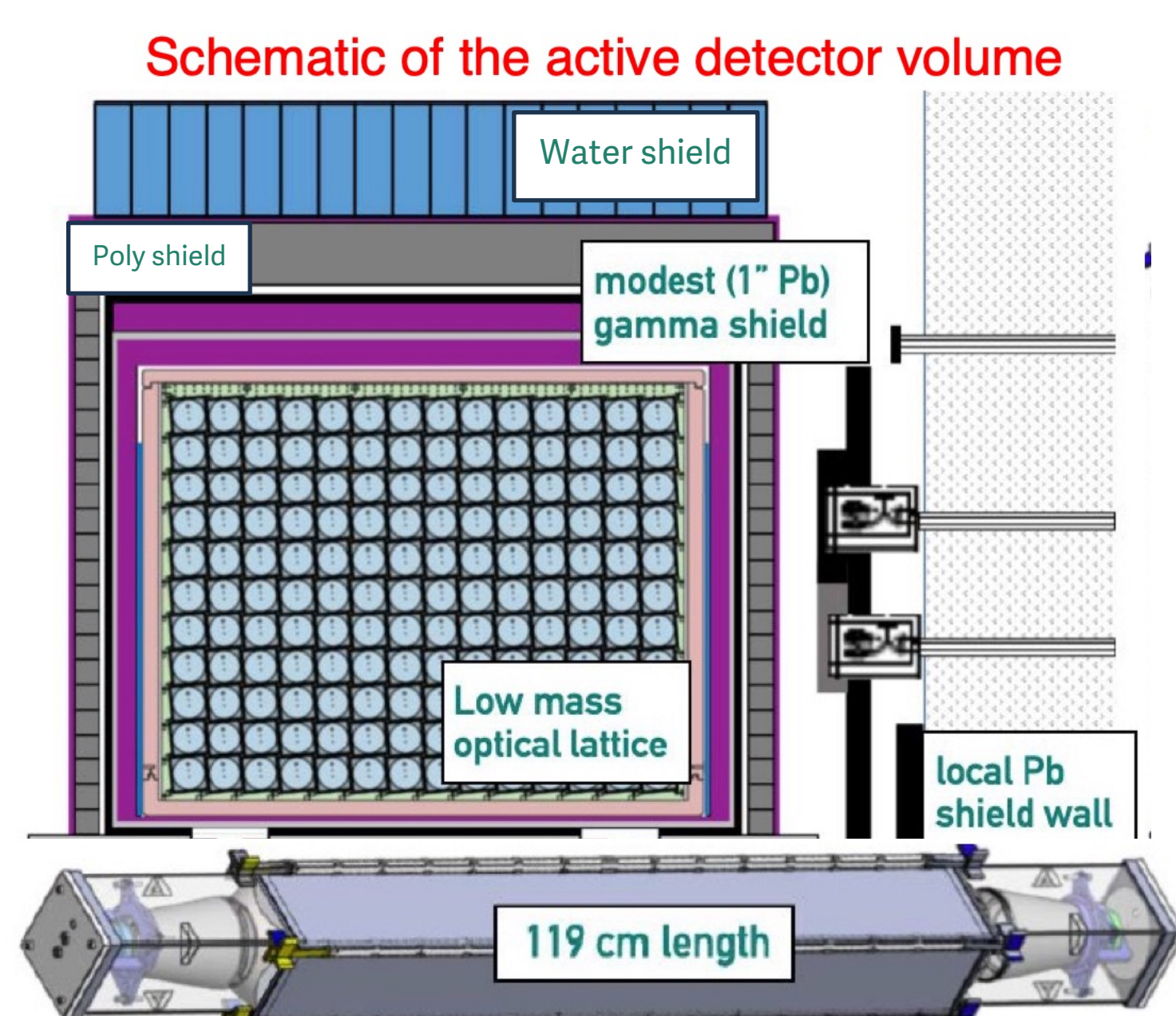
PROSPECT Motivation: Reactor Antineutrino Anomaly

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

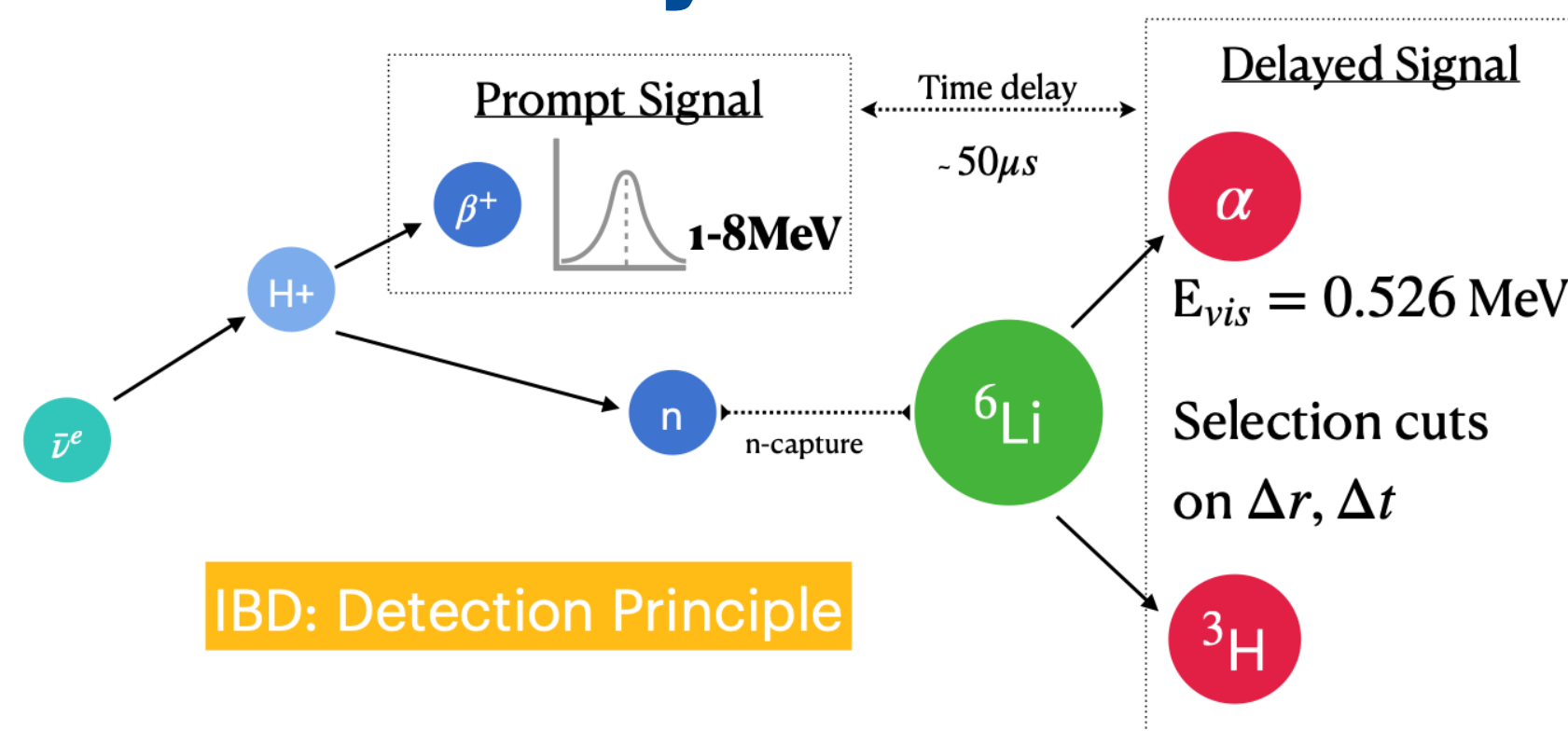


PROSPECT-I Design

- Reactor on data from Mar - Oct 2018
- 6.7– 9.2m from HFIR



Inverse Beta-Decay Detection Principle

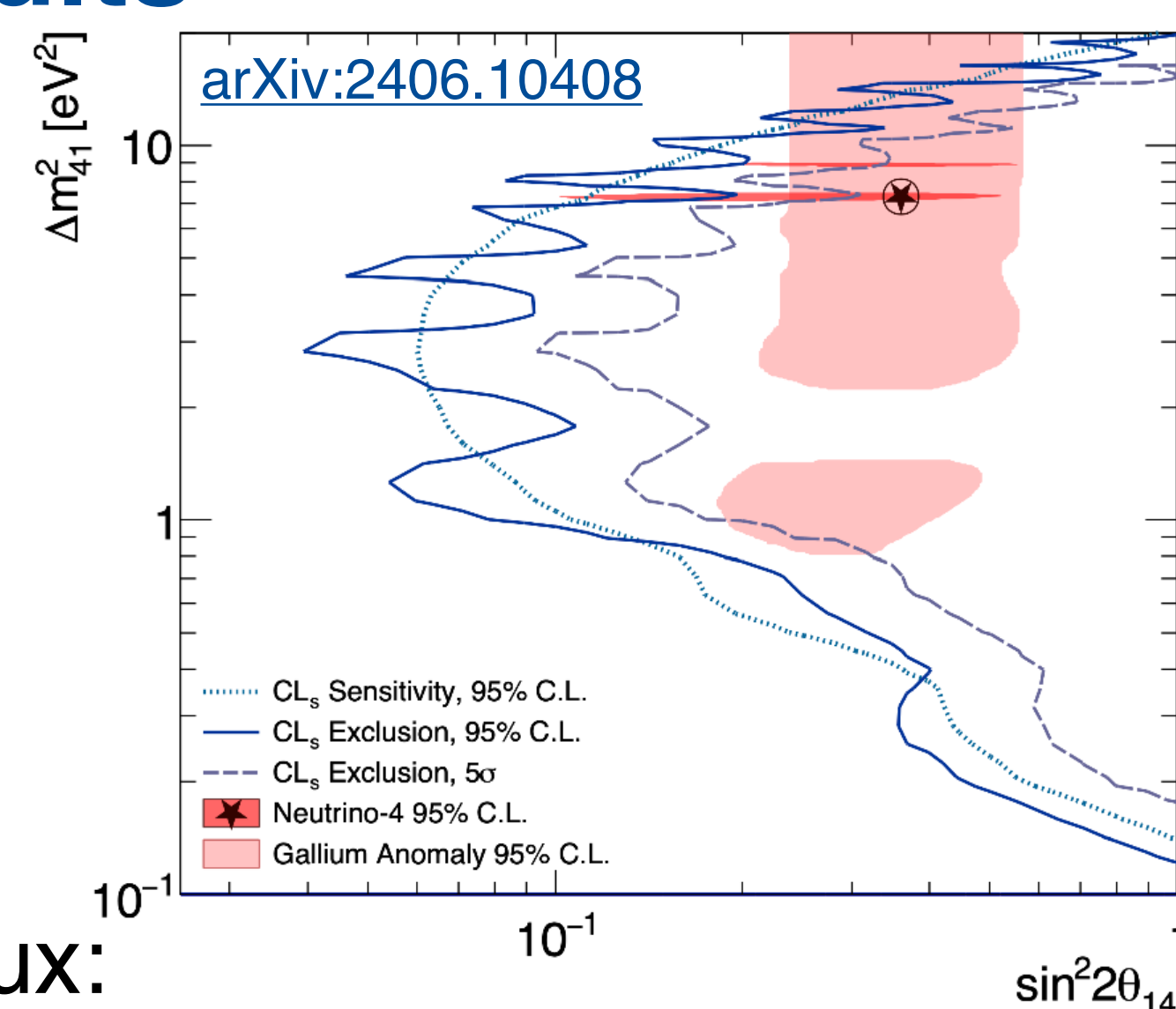


PROSPECT-I Physics Results

Great signal to background ratio and energy resolution S:B of 4:1

Oscillation:

- No indication of sterile neutrino and rejected neutrino-4 best-fit point at 5σ in final analysis



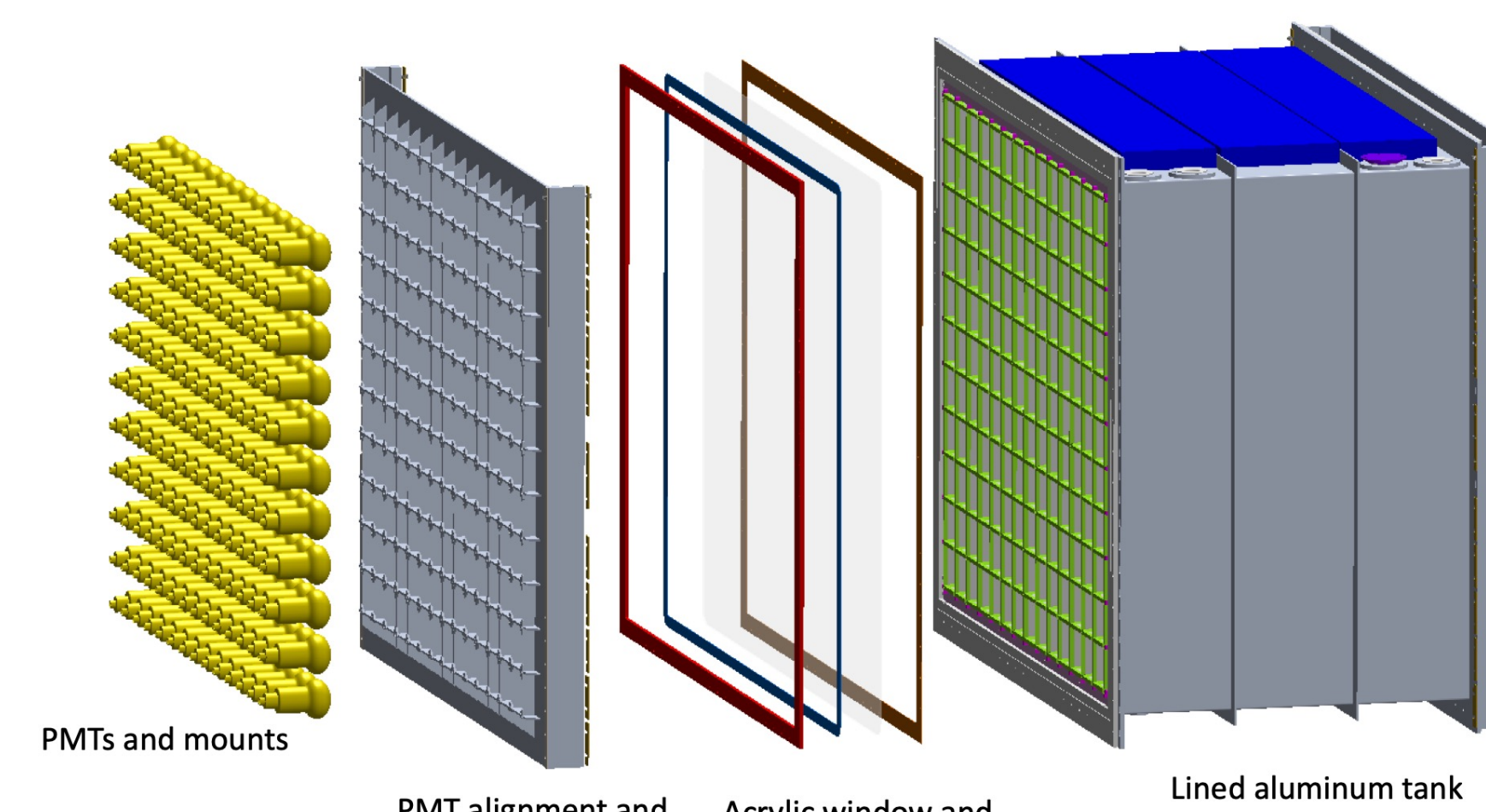
Flux:

- Observation of excess at $\sim 5 \text{ MeV}$
- Isotopic composition of 'The Bump': No ^{235}U disfavored at 3.2σ , All ^{235}U disfavored at 2.2σ

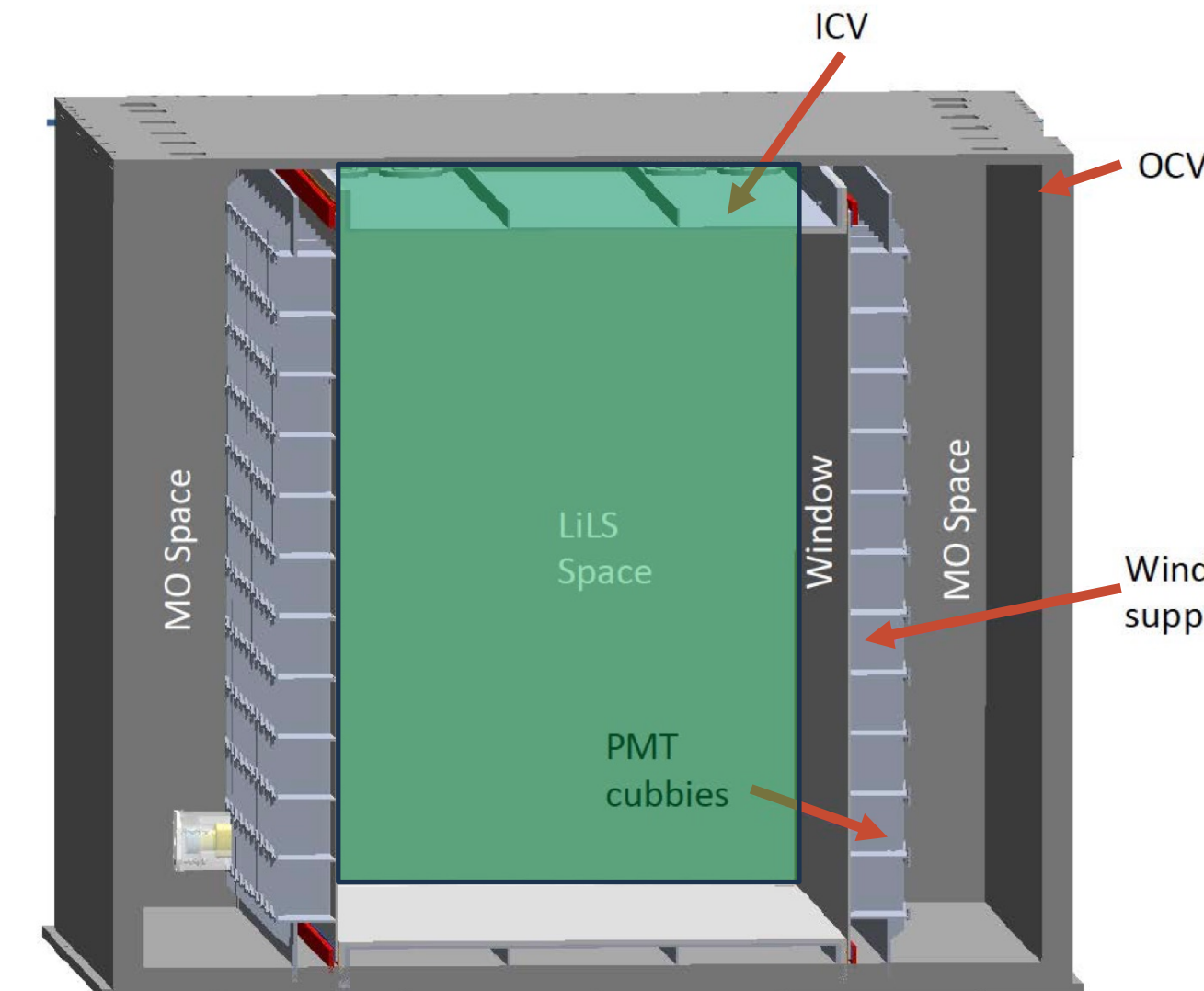
PROSPECT-I Challenges

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

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

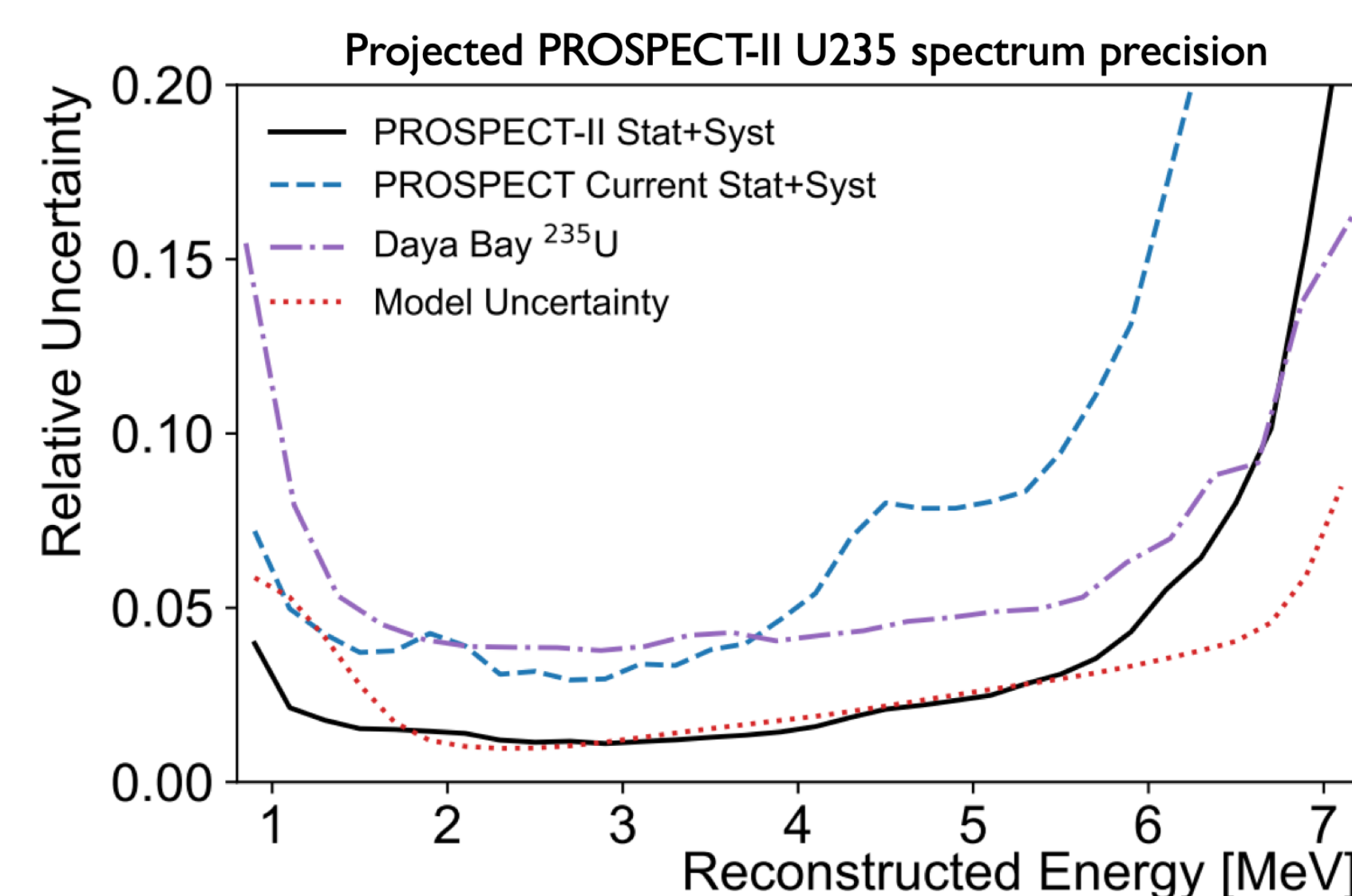
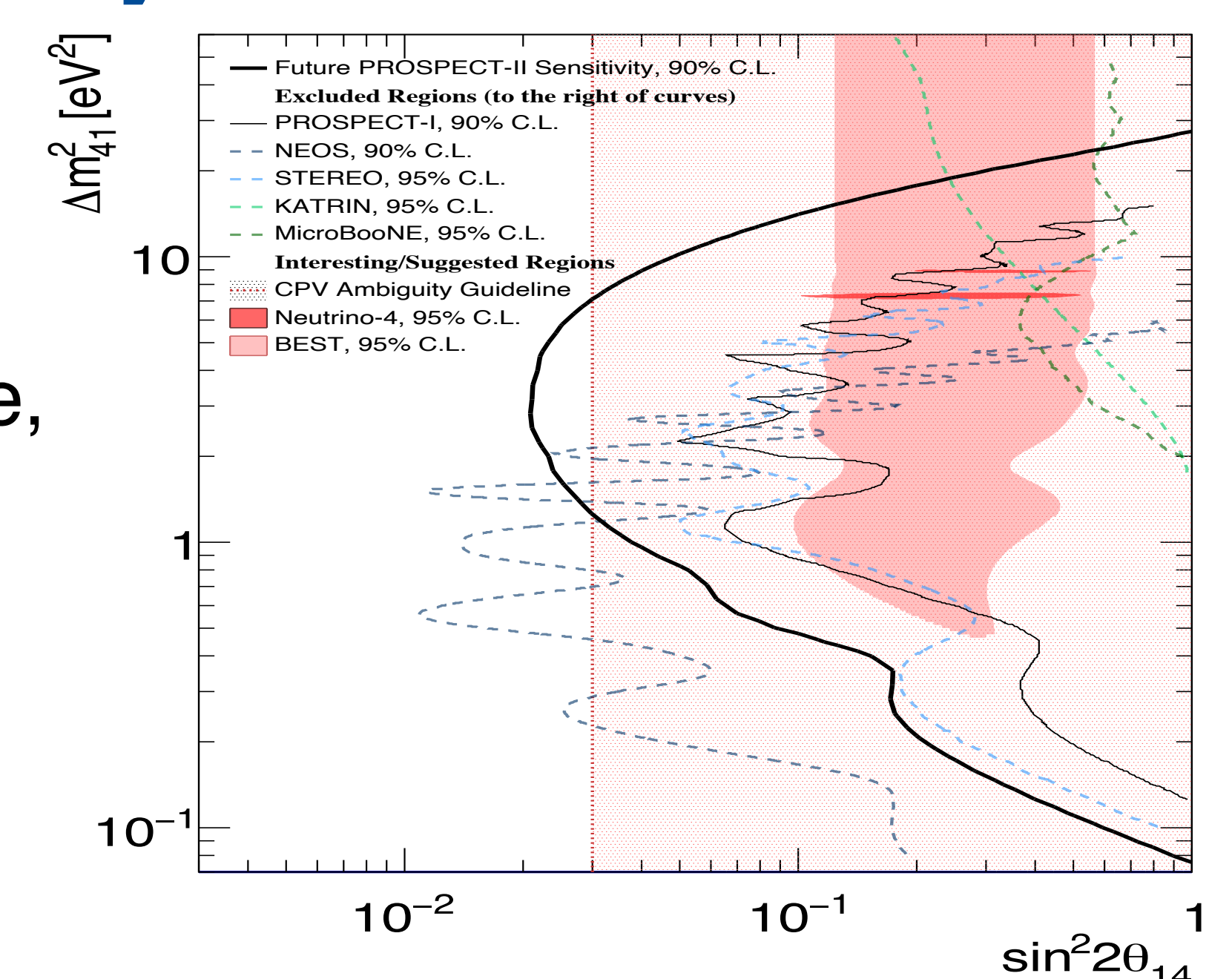
Extended sensitivity in $\sim 2y$:

Parameter	P1	P2 at HFIR	P2 at LEU
Effective Statistics (N_{eff})	15195	2.08×10^5	1.79×10^6

PROSPECT-II Projected Physics Results

Oscillation:

- More phase-space coverage, specially at higher Δm_{41}^2
- Addresses Neutrino-4



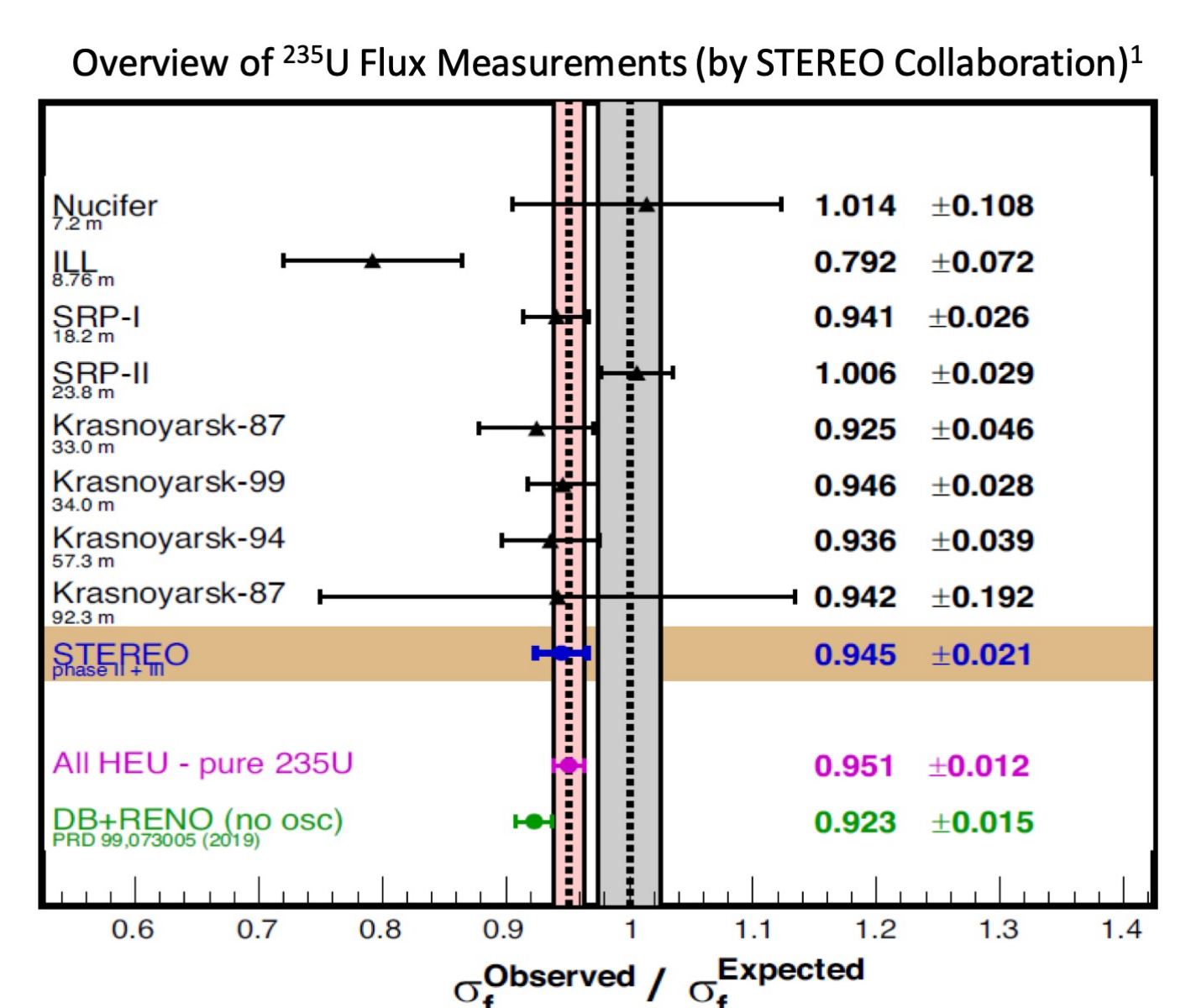
Spectrum:

- Double the precision, surpassing the model uncertainties for the majority of the antineutrino spectrum

Absolut Flux:

P2 can be superior to STEREO's

- Fundamental for reactor CEvNS experiments
- Provide better limits on BSM phenomena



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