

The SoLid Experiment

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On behalf of the SoLid collaboration

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SoLid

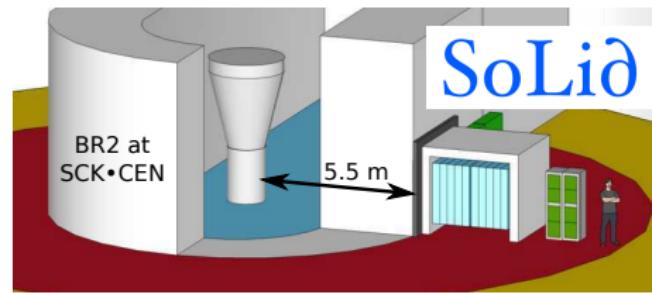


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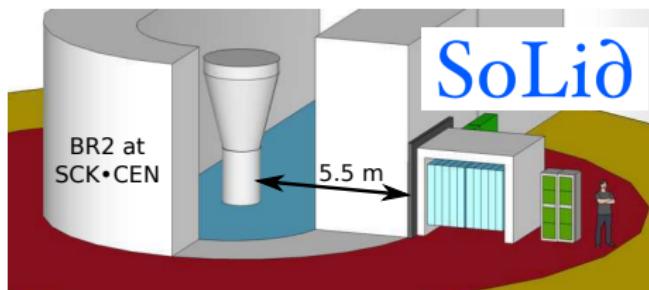
Overview

- The SoLid experiment
- Detection principle
- Experiment phases:
 - R&D: 8 kg prototype
 - Phase 1: 288 kg module
 - Phase 2: 2.88 T detector



SoLid experiment

- Probe reactor anomaly
- Demonstrate reactor monitoring
- 5 - 10 m from BR2 reactor core
- 2.88 T detector
- $5 \times 5 \times 5 \text{ cm}^3$ PVT cubes
- ${}^6\text{LiF:ZnS(Ag)}$ layers
- Wavelength shifting fibres
- Silicon photomultipliers



SoLid Collaboration

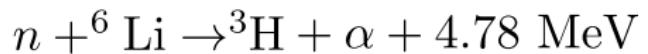


BR2 reactor at SCK CEN

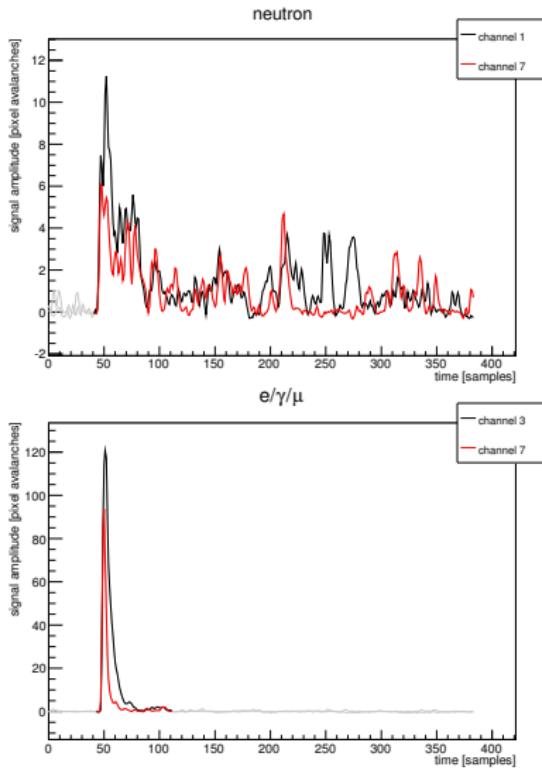
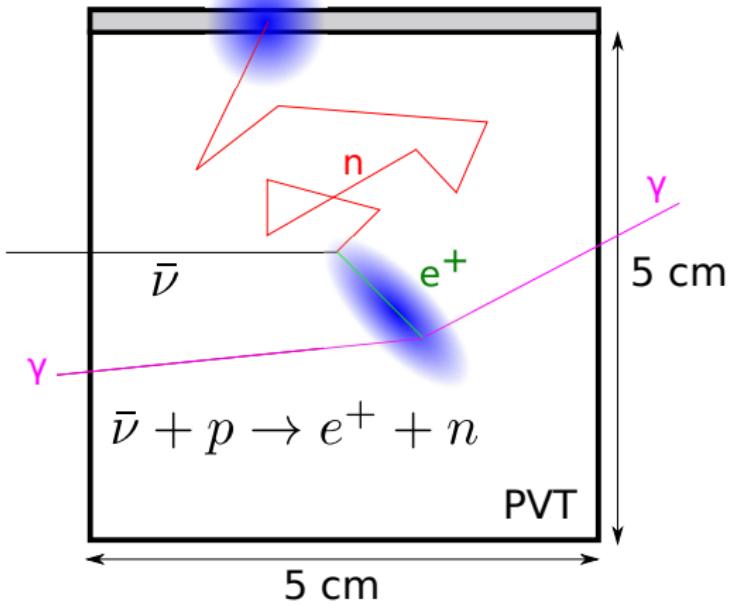


- Highly enriched uranium
- Compact reactor core
- Low background rate
- No nearby experiments
- SCK•CEN are awesome

Detection principle - composite scintillator

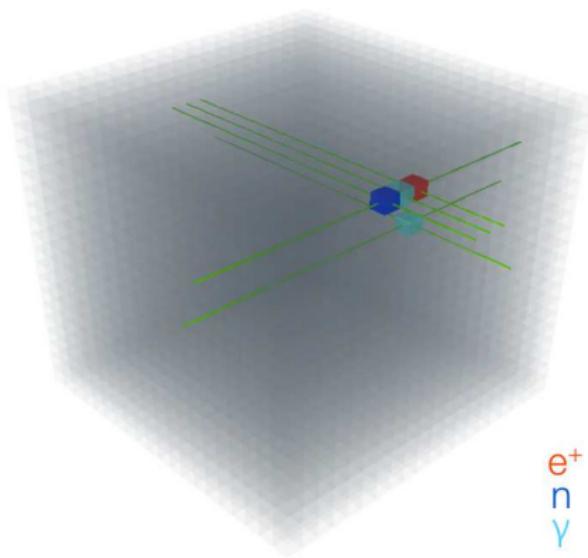


${}^6\text{LiF:ZnS(Ag)}$



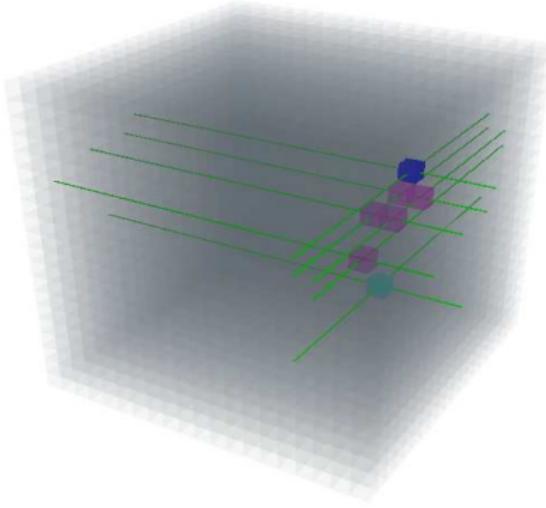
Detection principle - segmentation/topology

Inverse beta decay event



e^+
n
 γ

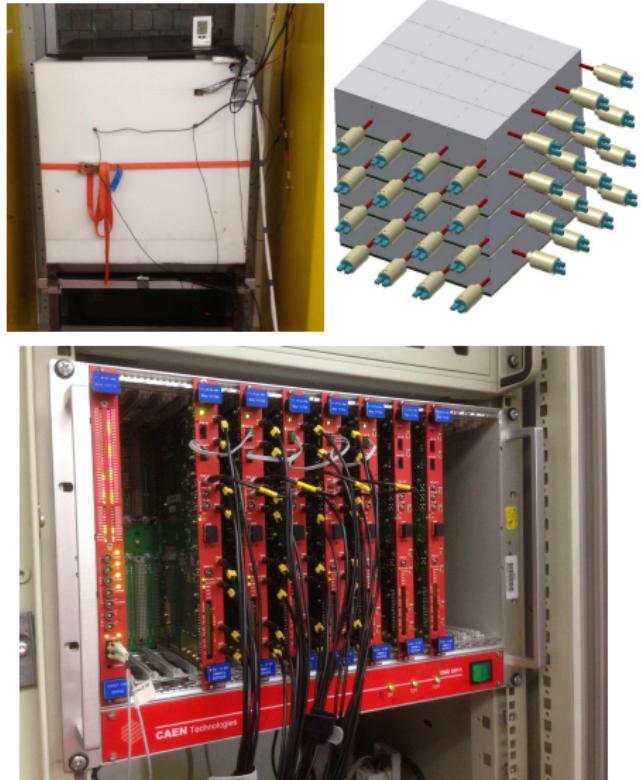
Fast neutron event



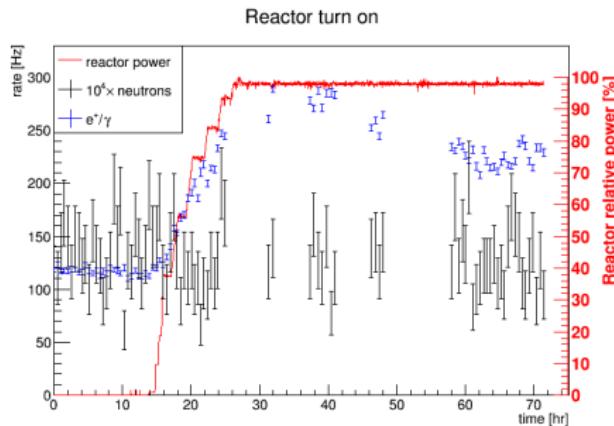
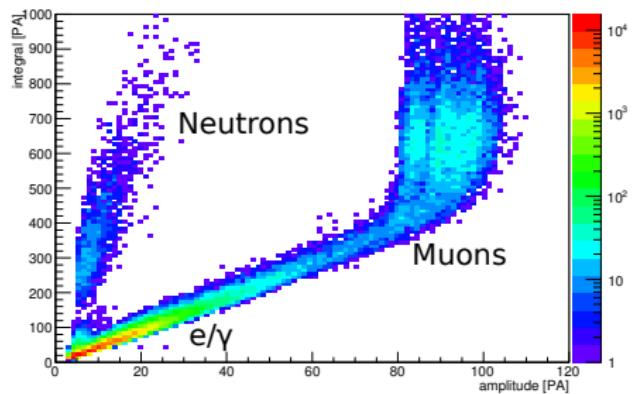
8 kg prototype detector

Purposes:

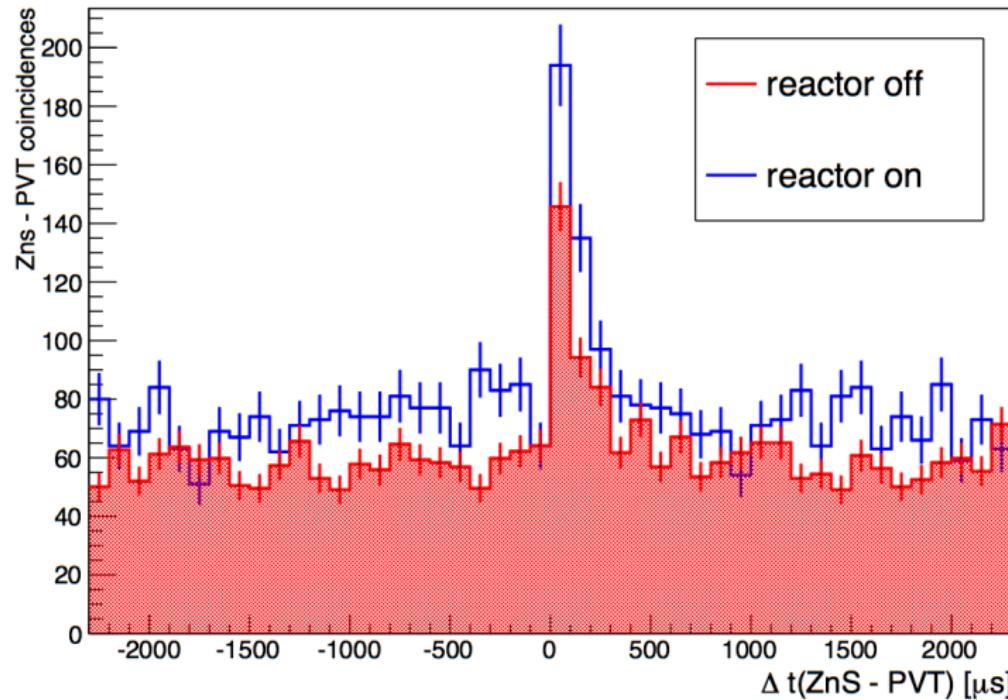
- Proof of composite scintillator concept
- Develop reconstruction techniques
- Measure backgrounds at experimental location
- TRL 2 - 3



8 kg prototype detector - particle ID



8 kg prototype detector - time coincidences



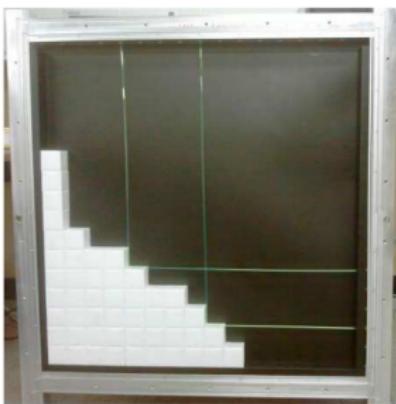
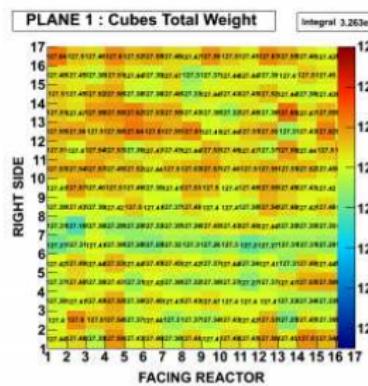
288 kg detector module

Purposes:

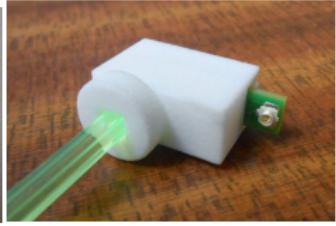
- $80 \times 80 \times 45 \text{ cm}^3$
- Proof of event topology concept
- Measure $\bar{\nu}_e$ energy spectrum
- Compare measured and calculated flux and spectrum
- Demonstrate reactor monitoring
- Scale up production, DAQ, etc.
- Improve reconstruction, analysis
- TRL 3 - 5



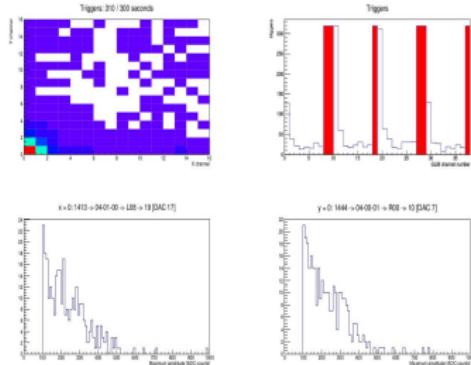
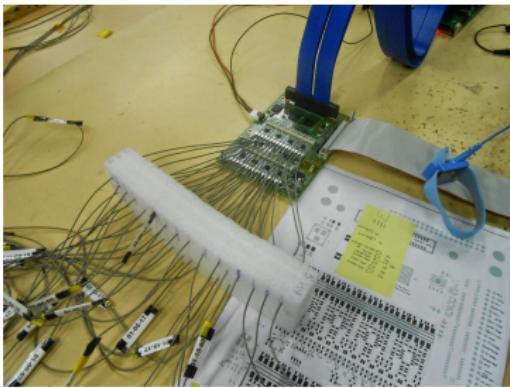
288 kg detector module - construction



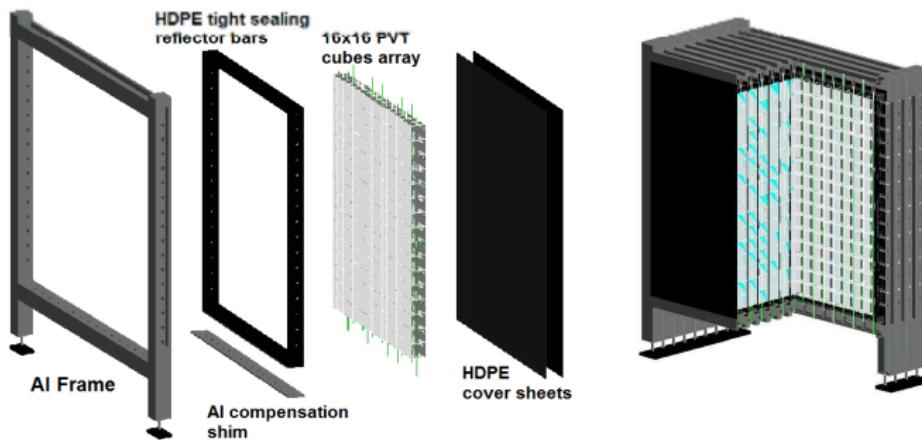
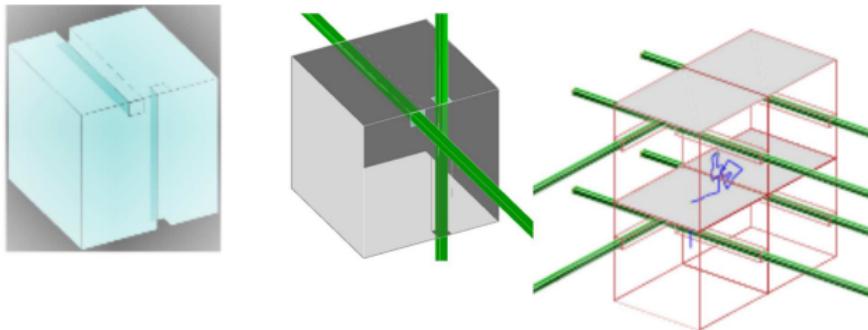
288 kg detector module - electronics



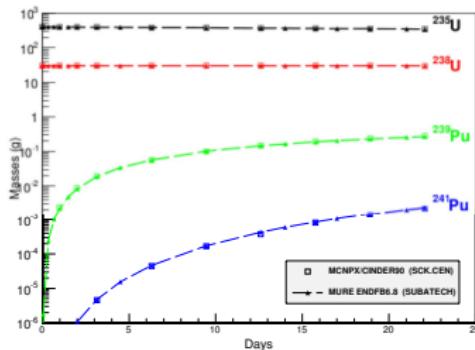
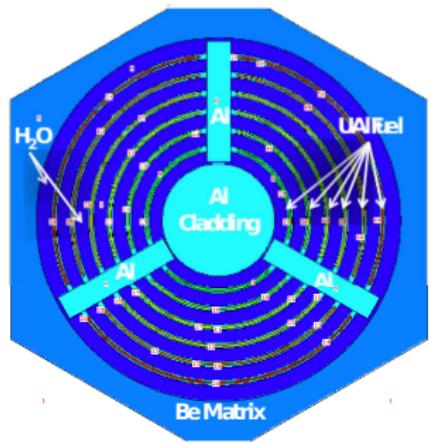
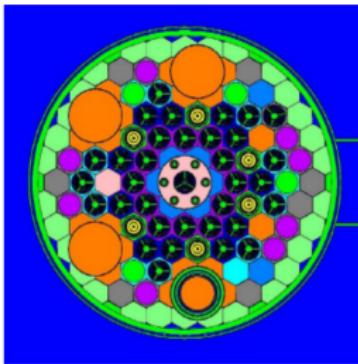
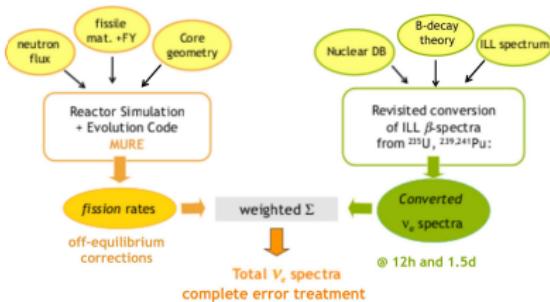
288 kg detector module - source tests



288 kg detector module - simulations



288 kg detector module - reactor calculations



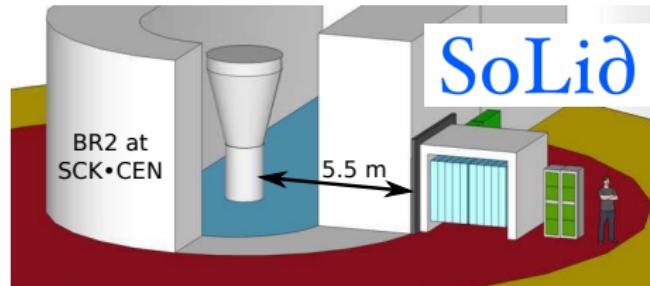
288 kg detector module - deployment



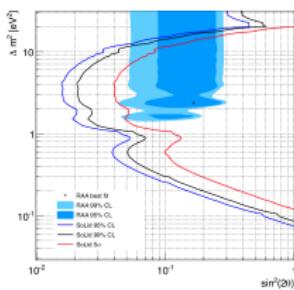
2.88 tonne detector

Purposes:

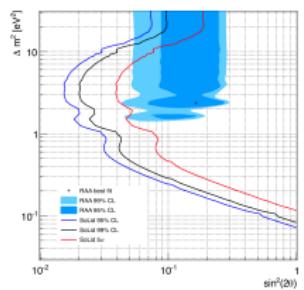
- Measure or rule out short baseline oscillations
- Industrial detector production
- Online $\bar{\nu}_e$ energy spectra
- TRL 5 - 7



Shape only



Rate and shape



Conclusions

- R&D phase of SoLid experiment nearing completion
- Backgrounds at reactor measured with 8 kg prototype detector
- First phase of SoLid experiment ongoing
- 288 kg detector deployed and starting to take data
- Second phase to start soon
- Construction of 2.88 T detector

SoLid