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Case study from LANL: Archiving Experimental Nuclear Data

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NNSA National Nuclear Security Administration Managed by Triad National Security, LLC, for the U.S. Department of Energy's NNSA.

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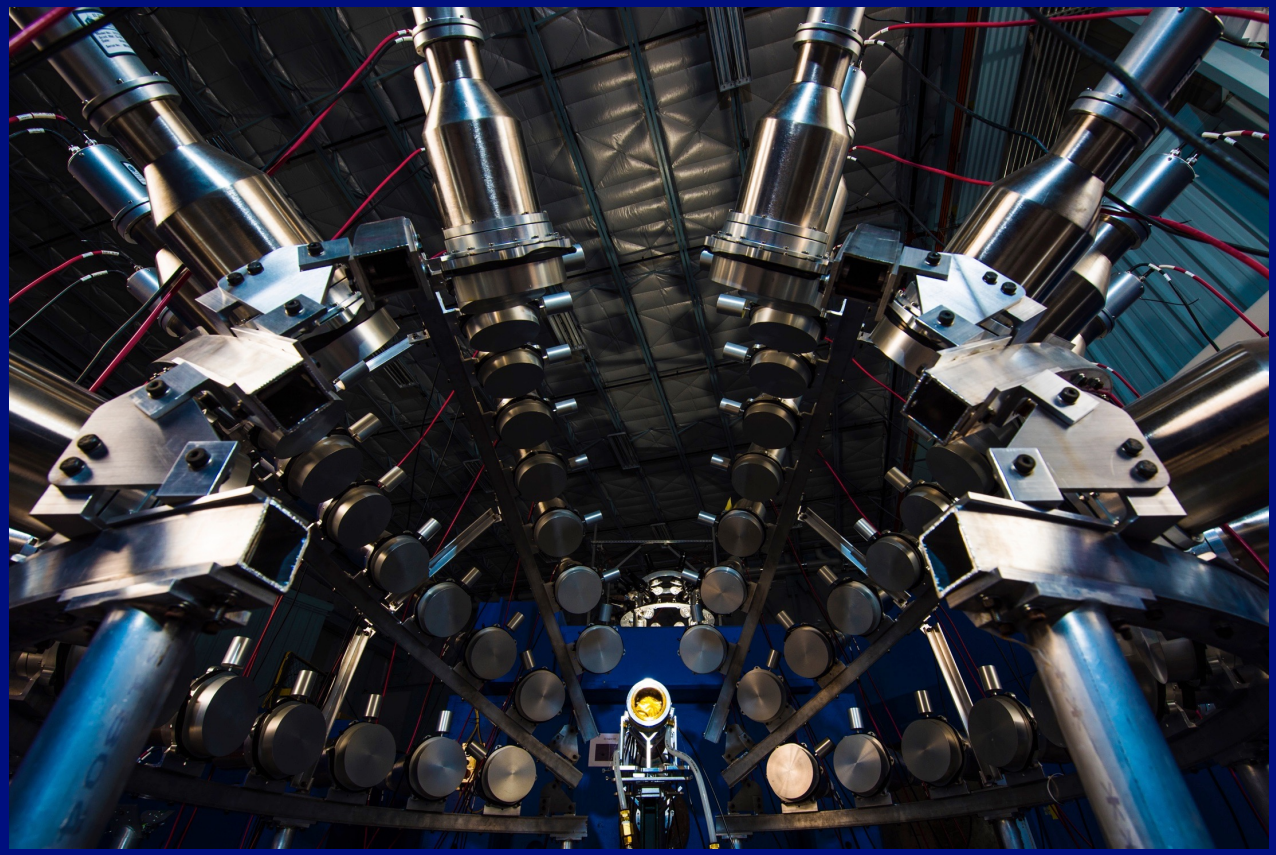
Chi-Nu

Neutron detection:
Li Glass Scintillator Array
- 40 cm distance
- 21 ^{6}Li Glass detectors
- 1 ^{7}Li Glass Detector

EJ309 Liquid Scintillator Array
- 1 m distance
- 54 detectors

Fission detection:
10-cell PPAC built at LLNL for each actinide



Chi-Nu Liquid Scintillator Detector Array

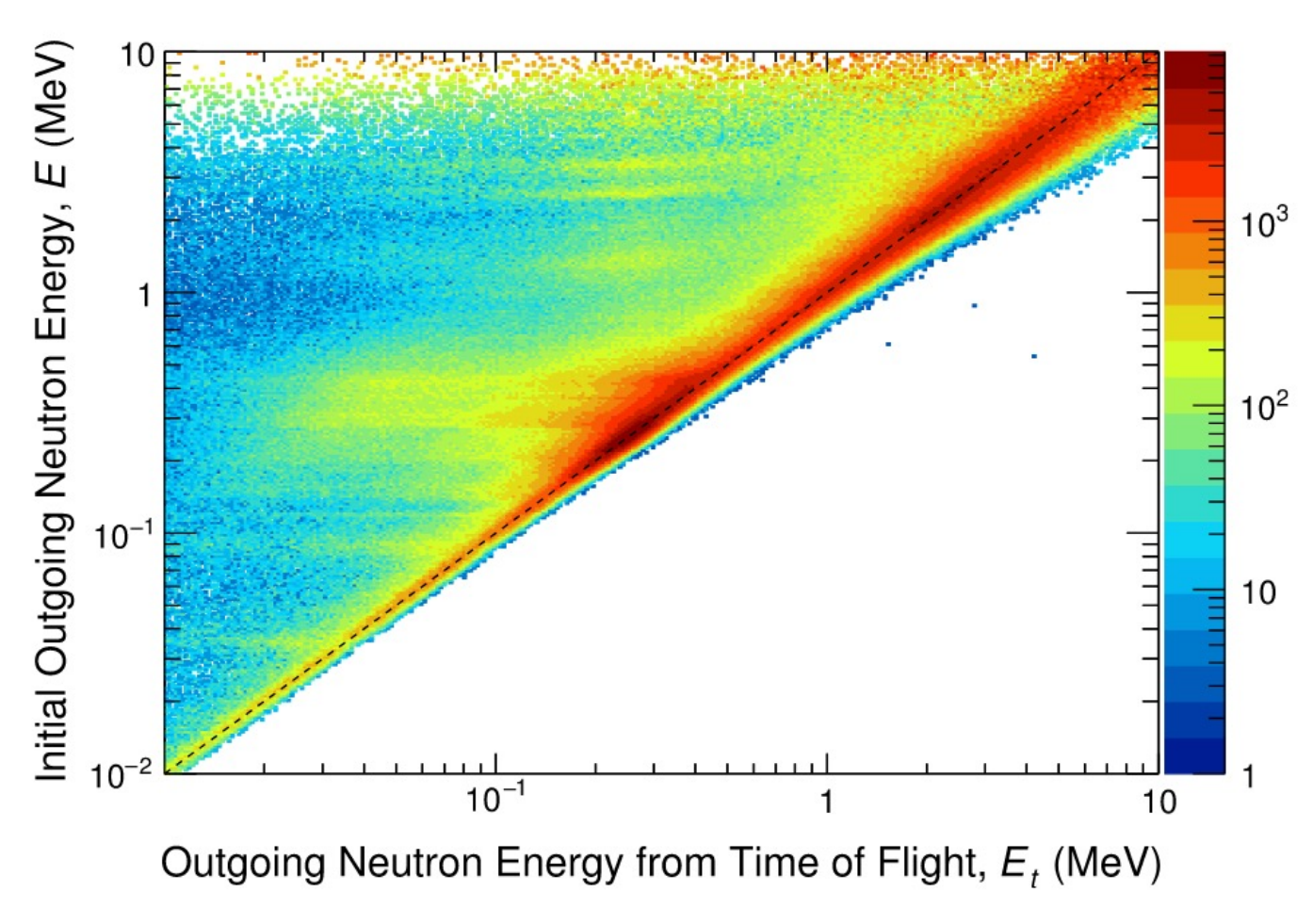
Chi-Nu

- All signals digitized asynchronously (CAEN 1730s)
- Waveforms not saved, typically PH (now two PH), timing information saved
- 54 + 12 detectors, plus a few other signals
- LANSCE/WNR beam is “on” about 6.25% of the time due to pulse structure, but data is taken at least 10% of the time
- Liquid scintillator runs were about 4 weeks
- Li-glass runs were about 3 months
- Data reduction and analysis involved numerous steps:
  - Timing alignment
  - Reflection and noise removal
  - Pulse Shape Determination (PSD) or ^{6}Li(n,α) Q value cuts, in addition to kinematic cuts
  - Random background determination
  - Response matrix computation and application

Funding agency wanted data archived for any potential future need

- Funding is from the NNSA Office of Experimental Science (OES), NA-113
- Chi-Nu was a 12+ year project, with a total cost > $20M Since the data analysis uses nuclear data (in the response matrix), being able to re-analyzed the data down the road with ENDF/B-V11.0 sounded like a good idea.
- Or maybe someone years from now will wonder if we made some mistake…
- Note that re-doing the measurement in the future might cost considerably more
- Non-LANL storage were not contemplated – since OES paid for these data, I'd assume their permission would be needed to give the data away?

Neutron response matrix for the Chi-Nu Li glass array



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Chi-Nu Data

Three major actinides with Chi-Nu PFNS data:
^{239}Pu
^{235}U
^{238}U

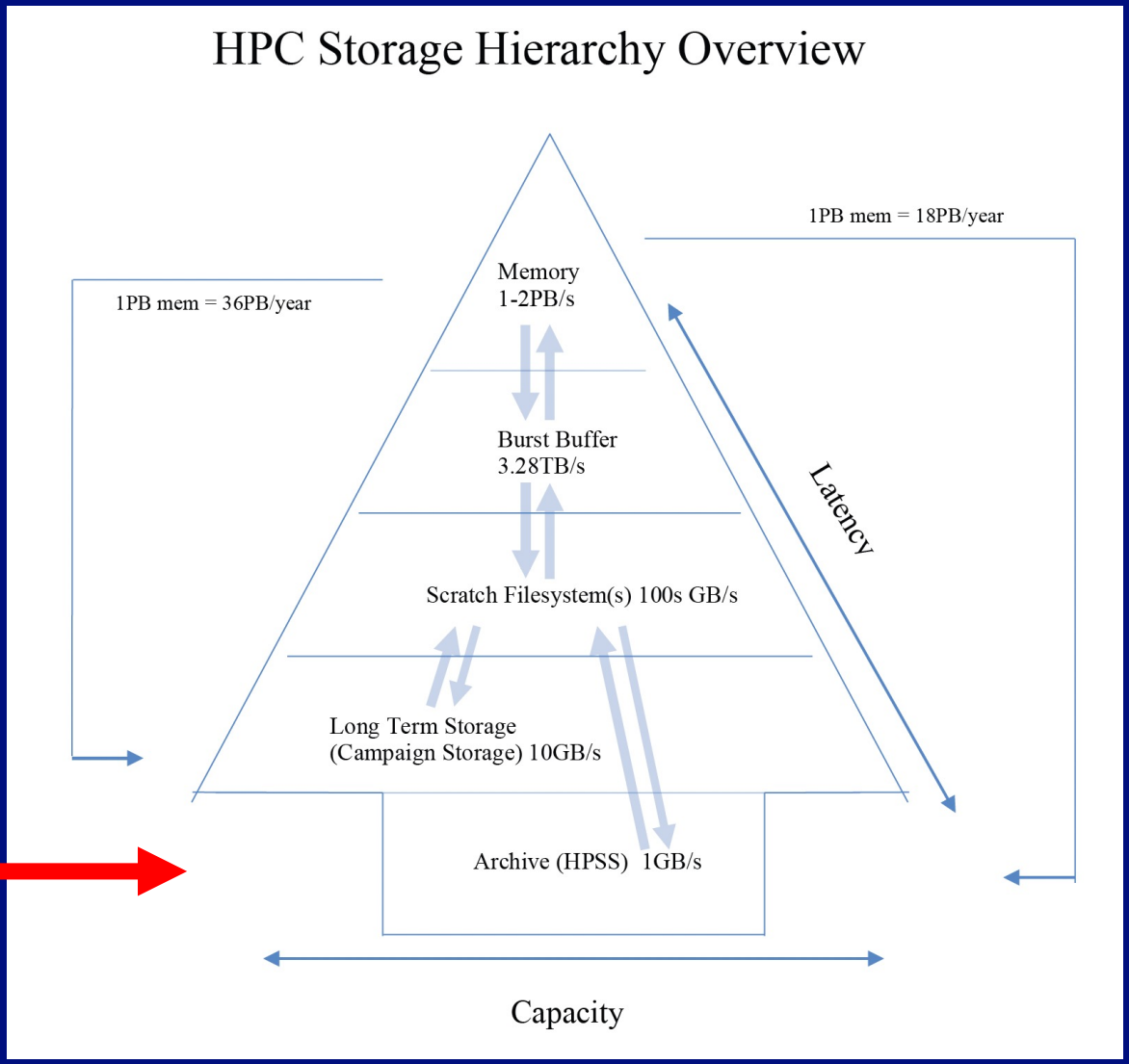
Each with approximately 5 TB Liquid Scintillator Array Data
and 10 TB Li-glass Array Data

45 TB total so far

(^{240}Pu PFNS data will also be archived)

Saving the data is the easy part, though…

What LANL institutional options for archiving data are available?



What else to archive?

- Enough information in order for someone to understand the data
- The analysis codes, the parameter files -- detector distances, etc., AND analysis parameters – timing offsets, event rejection criteria
- Also, for these data, need the MCNP-calculated neutron response matrices. And how they were calculated.
- What about log books?
- Can I assume that CAEN firmware manuals will be available elsewhere? Will they be needed?
- What am I missing?

- There is likely no way I am going to anticipate every detail for ssomeone 30 years from now…

Suggestions?