

Focus Area: 1

FY23 TRL: 4

FY24 TRL: 4

FY24 Task Goals/Deliverables and status:

- Modelling
- Detector fabrication
- Electronics development
- (deliverable) Detector selection report

PROACTIVE GORs:

**Relevant FA1 topics**

- SNM absence
- Warhead confirmation
- Dismantlement
- (possible) Type identification
- HE absence
- Disposition confirmation

Use Case(s):

**Dismantlement confirmation**

- Confirm warhead presence before
- Confirm warhead absence after
- Confirm SNM separated from HE

**Template initialization**

- Confirm that initial item presented for template measurement is a warhead

**(possible) Type verification**

- Use SNM geometry in a warhead to identify type

**Integration Across PROACTIVE:**

Participation in venture experiments

Development of information-secure readout and analysis techniques

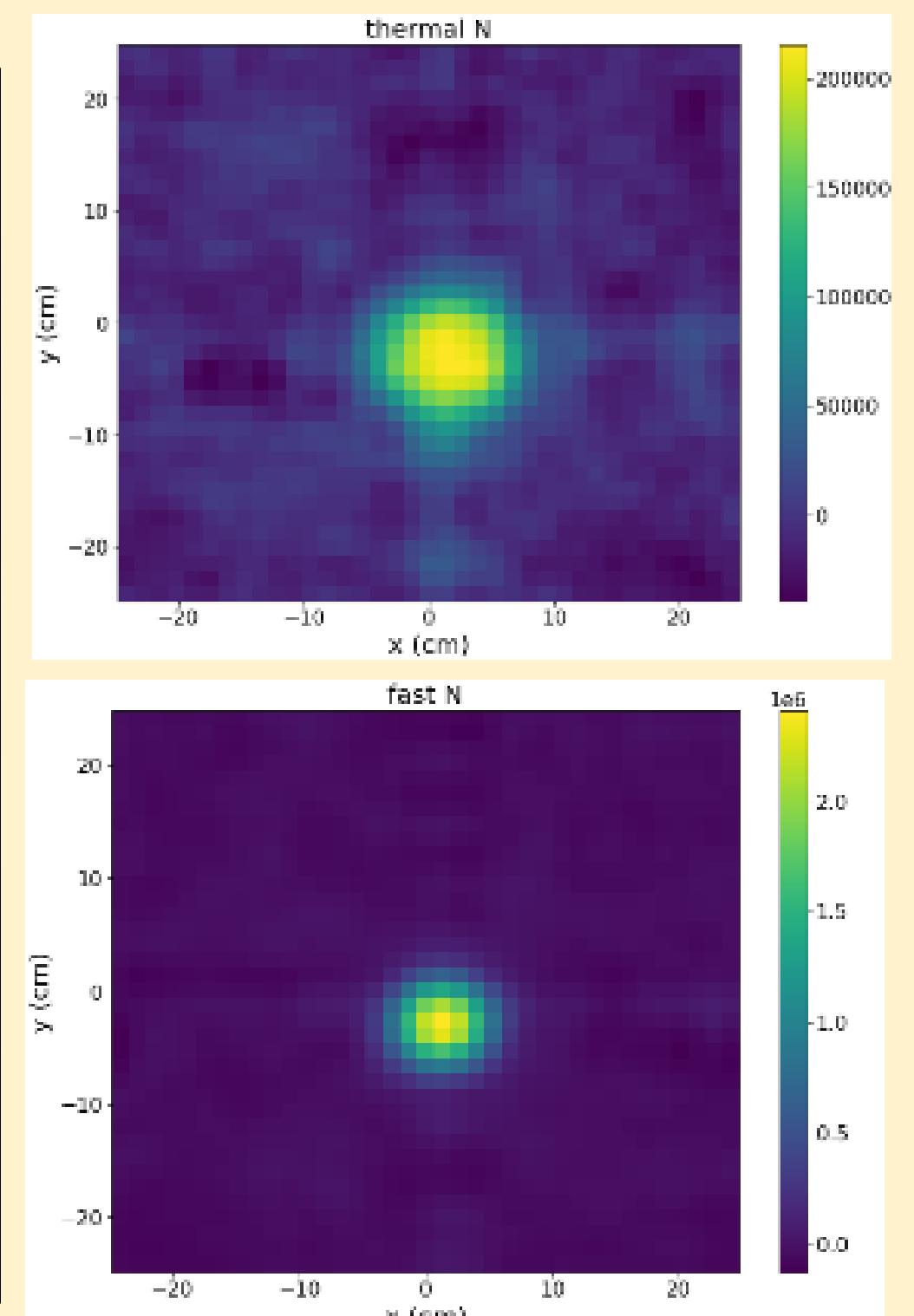
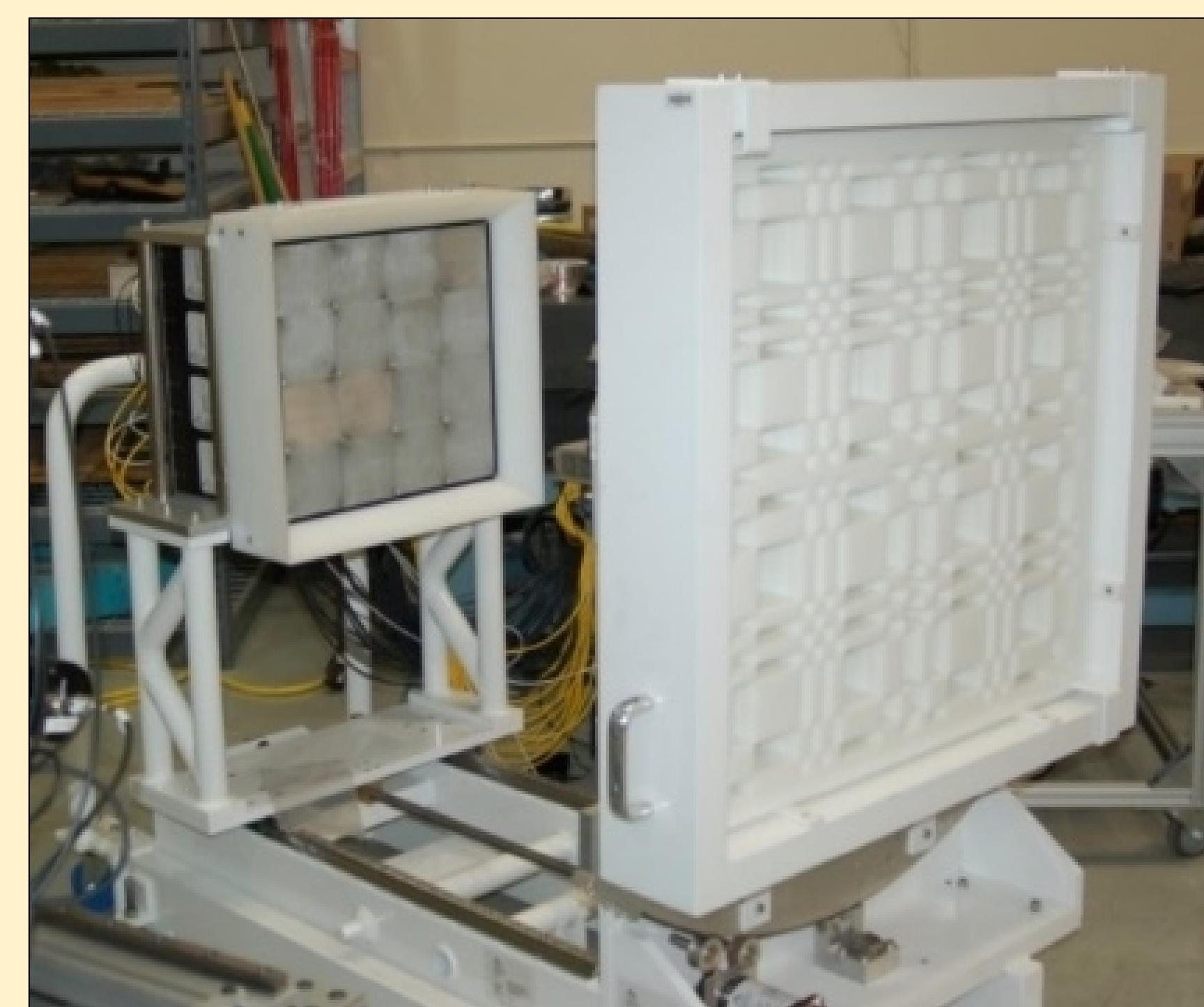


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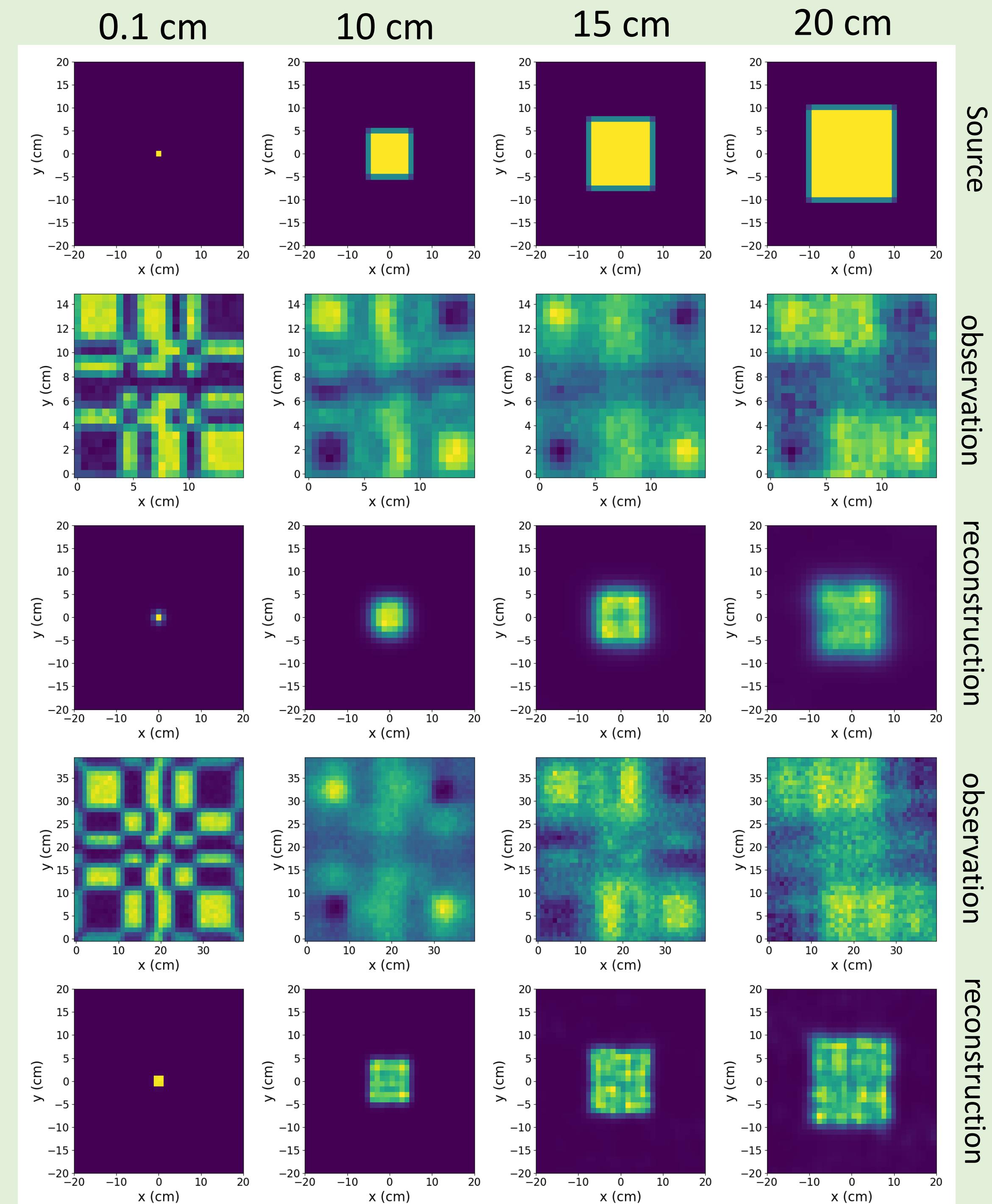
**Technical Objectives**

Design, fabricate, commission, and field a coded aperture neutron imager for use in an arms control context.

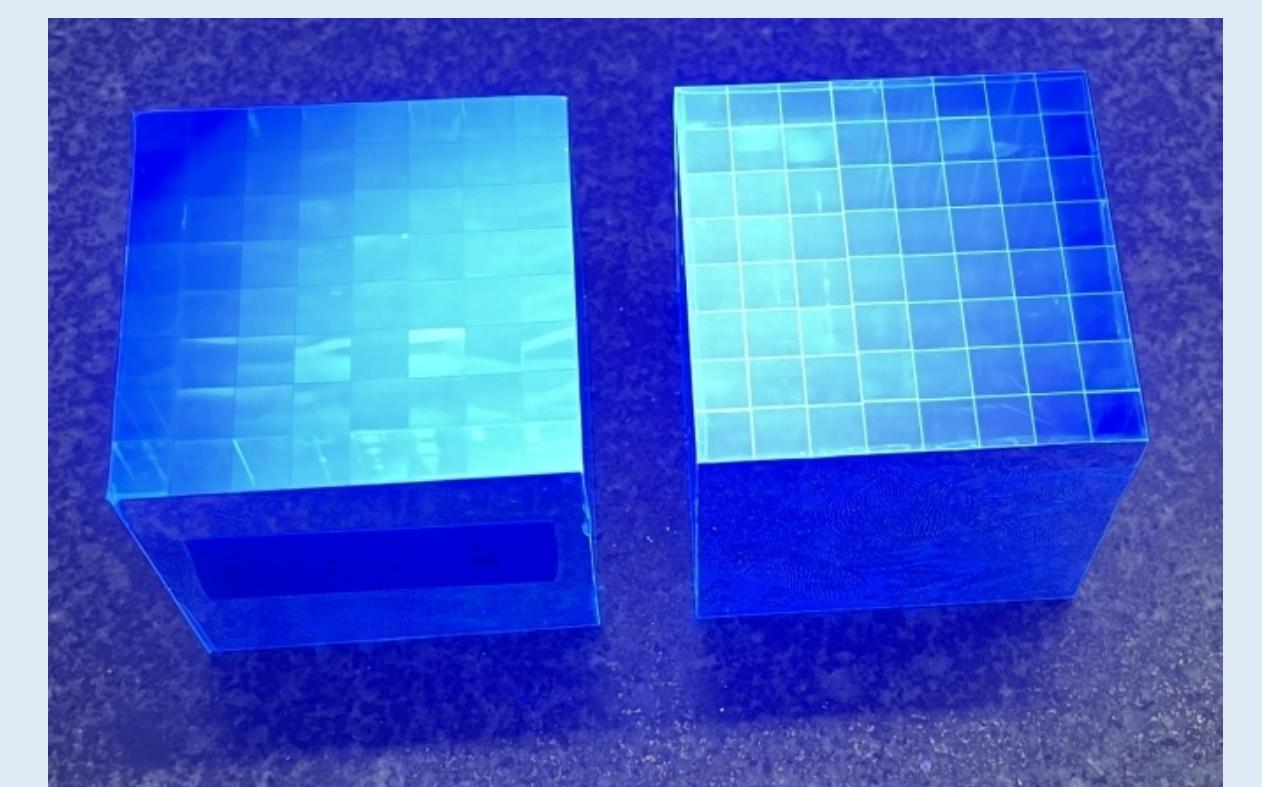
- Modelling to investigate use cases and information at risk
- Production of a 24x24 pixelated neutron detector based on organic glass scintillator and read out by SiPMs
- First-pass electronic readout for participation in venture experiments
- Second-pass electronic readout system for robust information protection

**Modelling**

- Mask based on rank 11 Modified Uniformly Redundant Array (MURA)
- Response map generated via ray-tracing and material dependent attenuation
- Image reconstruction via MLEM

**Scintillator**

- Selected organic glass scintillator (OGS) as fast neutron detector
  - Mixed with PVT for subtractive processing
  - OGS produced by Patrick Feng at SNL-CA
  - 8x8 blocks fabricated at ORNL
    - Pixels separated with aluminized ESR
  - First test blocks with 50% OGS have been assembled

**Electronics**

- 3x3 grid of 64-pixel J-series SiPM arrays
- Read out via FMS1 PSD ASICs developed by DTRA
- Motherboard houses FPGA for ASIC readout

