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Material Characterization and 3D Imaging with Neutron Scatter Cameras

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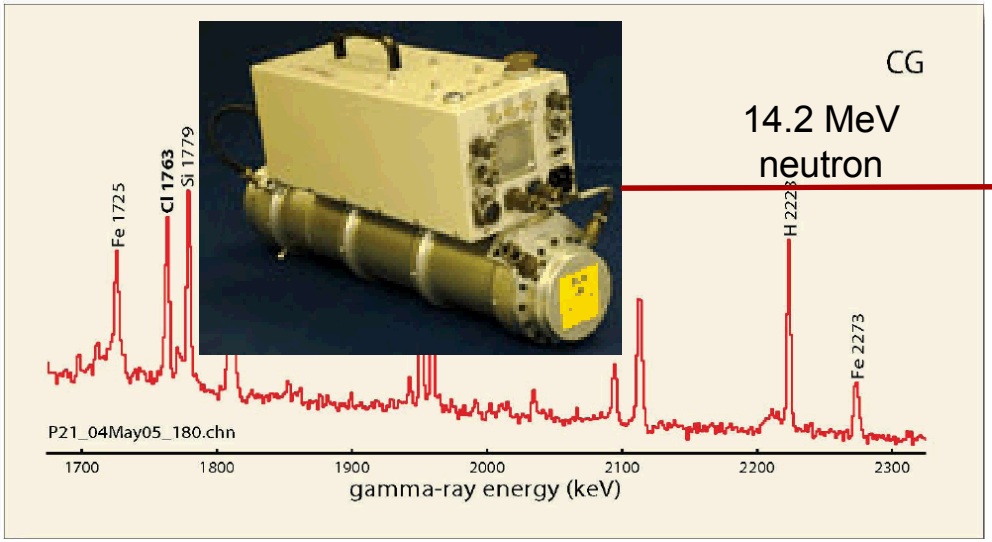
Instrument Overview

- Design capabilities:
  - Elemental characterization (similar to PINS)
  - *In situ* characterization.
  - Portable, DT-PINS + two 3x3” fast neutron detector
  - 3D elemental imaging (~1 m away, ~2 cm resolution) with single side characterization
  - Current **TRL: 0.5**

PINS and Neutron Detection

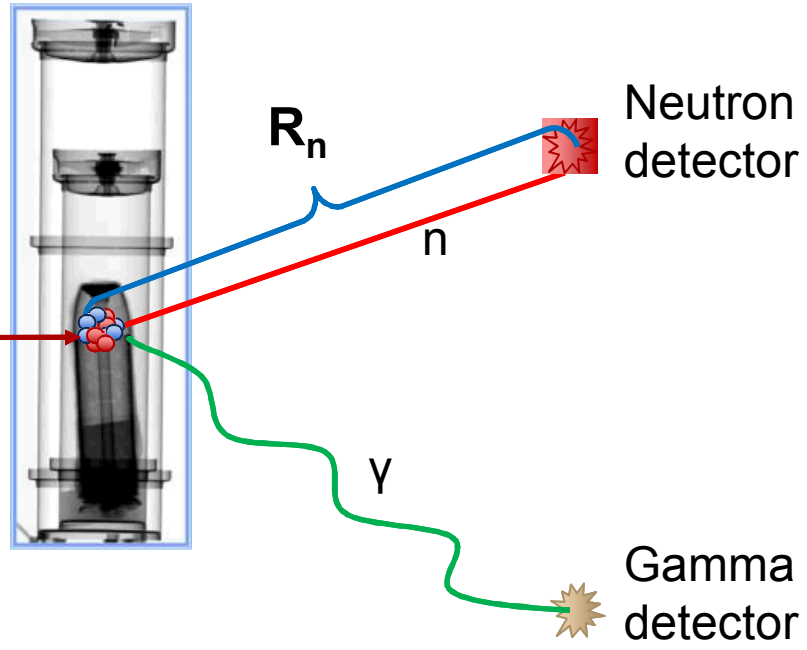
PINS

- Probe sample with either ^{252}Cf or **DT** neutron generator
- Signature is gamma spectra
- Requires neutron-induced interaction that emits a gamma particle with unique energy for each element

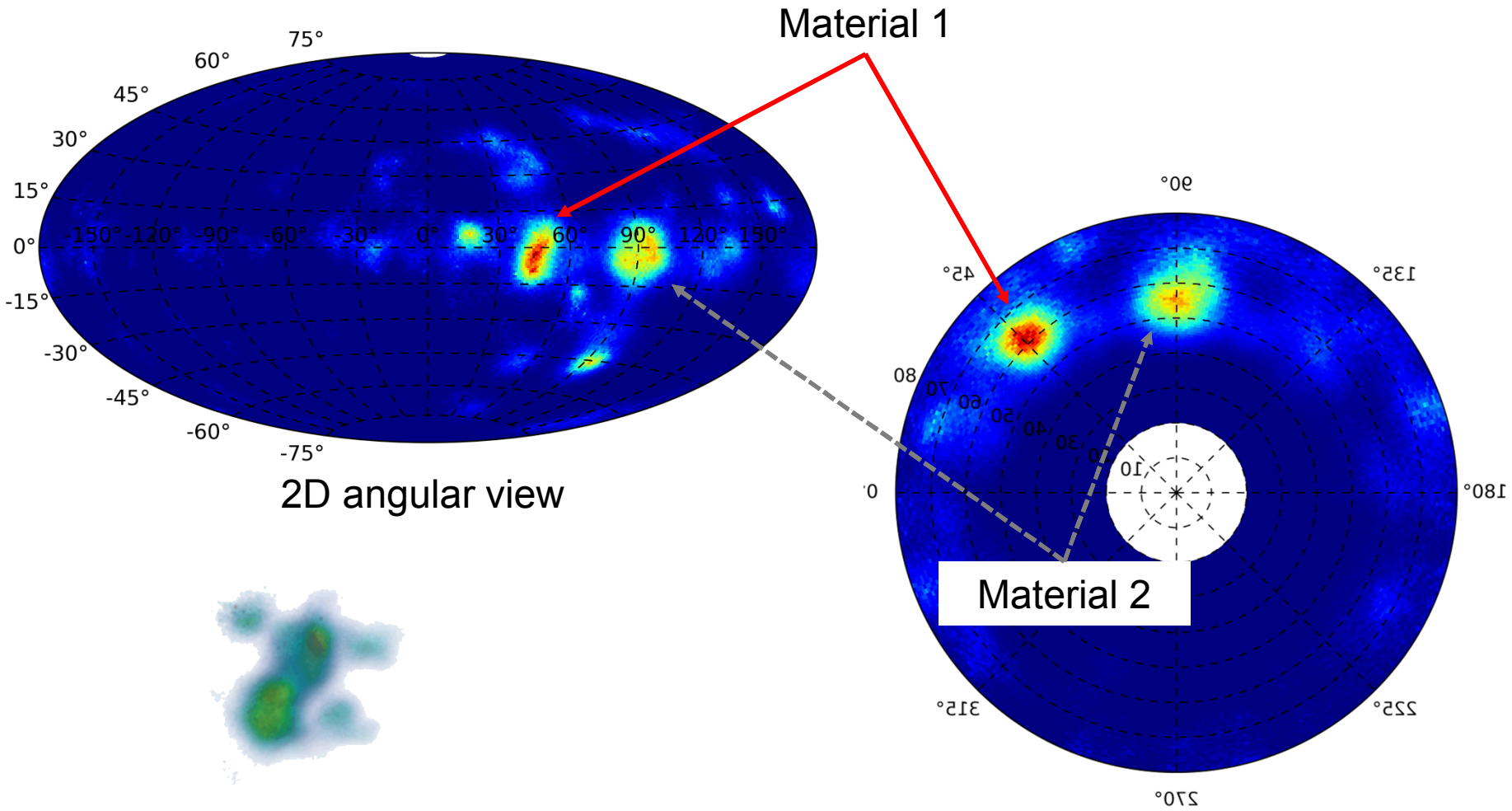


+Neutron Detection

- Measure time difference between neutron and gamma
- Provides distance information (imaging) and neutron energy
- Neutron + spectrum provides elemental information



Example (Active 3D imaging, and Low-Z ID):



Possible CONOPS

First Concept
- X-Ray provides contextual information
- 3D imaging provides elemental map overplayed on X-ray image

Second Concept
- Characterize multiple munitions simultaneously

Third Concept
- Single-sided active imaging, enables buried munitions characterization

Augmented Reality