

X-Ray, Gamma, and Neutron Imaging

Researchers at ORNL are adapting, developing, testing, and evaluating x-ray, gamma, and neutron imaging technologies that support homeland security initiatives. X-rays, gamma rays, and neutrons provide a suite of capabilities for analyzing the internal structure of containers. This analysis not only provides structural shape information, but can also provide signatures that indicate material parameters such as density, type, and fissionability.

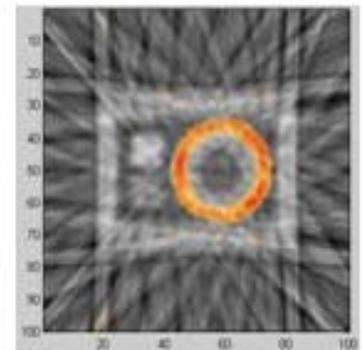
Combination of imaging modalities and techniques are used to provide capabilities for detecting, localizing, identifying, verifying, and characterizing threats within a container. These threats include radiation sources associated with special nuclear materials, improvised nuclear devices, and radioactive dispersive devices, explosives, and contraband.

Base Technology

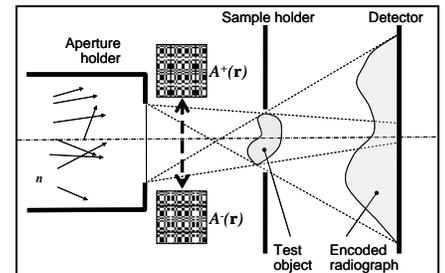
ORNL is working with multiple technologies that can provide x-ray, gamma and neutron imaging capabilities for near-field, far-field scanning as well as for detailed computed tomography applications to peer into the geometry of materials in closed containers. These technologies include traditional tomographic reconstruction for shape, reconstruction of tomographic fission reconstruction for localization of special nuclear material, iterative reconstruction for reduction of artifacts, combination of energies and source types for explosives and contraband detection, and coded source for improved resolution in neutron imaging.

Specifications and Features

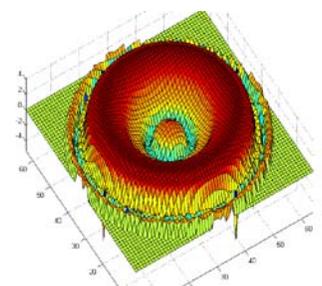
- Computed tomographic reconstruction capabilities
- Source and detector modeling capabilities
- X-ray, Gamma, and neutron radiography capabilities
- Image fusion



Fission reconstruction result (color) fused with neutron transmission image (gray)



Coded source neutron radiography for improved efficiency over equivalent pinhole camera.



Coincidence CT cross-section (based on MCNP model) of a canister containing Uranium cylinder and a poly rod.

The next generation of

National Security

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