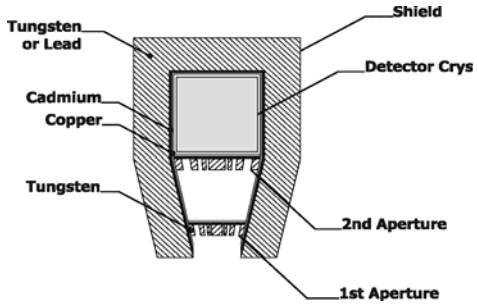
ESTD
Engineering Science & Technology Division

National Security

Passive and Active Gamma and Neutron Imaging

Imaging for Treaty Verification and Wide Area Search and Localization

Researchers at ORNL are adapting, developing, testing, and evaluating passive gamma-ray spectroscopy and imaging technologies that support homeland security initiatives. New robust directional gamma-ray cameras are required to provide capabilities for detecting, localizing, imaging, identifying, verifying, and characterizing radiation sources associated with special nuclear materials, improvised nuclear devices, and radioactive dispersive devices. While the initial focus of these activities is to provide federal, state, and local governments with technologies for early detection and intervention at U.S. borders, these technologies also potentially provide additional capabilities for a host of security applications that include inhibiting nuclear materials diversion, international safeguard support, and the interdiction of nuclear and fissile material smuggling, and will provide critical tools and infrastructure for pre- and post-event scenarios.



Confocal coded aperture gamma camera with 10^3 – 10^4 improved collection efficiency over equivalent pinhole camera.

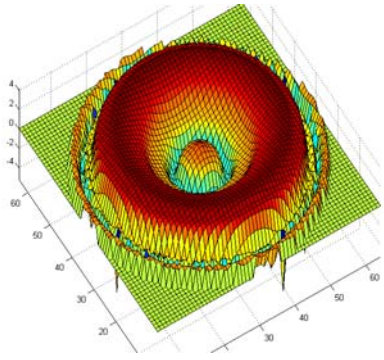
Base Technology

ORNL is working with multiple technologies that can provide gamma (passive) and neutron (active) imaging capabilities for near-field, far-field scanning as well as for detailed computed tomography applications to peer into the geomoetry of potentially fissile materials in closed containers. These technologies include passive imaging with simplified coded aperture devices, direct spatial frequency measurements with terrestrial Fourier cameras, and coincidence measuremements for computed tomography to dicern the geomerty of enclosed fissile materials.

Fourier camera demonstrator for terrestrial gamma imaging applications

Specifications and Features

- Source and detector modeling capabilities
- Passive gamma-ray imaging
- Novel implementations with simplified designs
- Active interrogation neutron computed tomography



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

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