

## EDXRD



### Energy dispersive X-ray diffraction to identify tissues

#### What is EDXRD?

The EDXRD technique exploits the Bragg law by fixing the diffraction angle ( $< 5^\circ$ ) and by scanning the energy range with a polychromatic spectrum and an energy resolved detector.

- EDXRD systems can use powerful **conventional X-ray tubes** and **commercial** multi-pixelated detectors to inspect a 2D plan of an object in one shot.
- Diffraction provides very **specific material signature**, reflecting the molecular and atomic structure of inspected materials (solids and liquids) **not available with conventional X-ray scanning**.

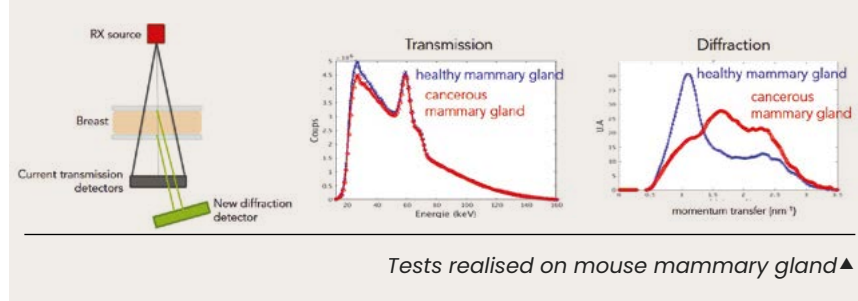
#### Applications

- **Medical**: precise diagnostic of breast tumors to dispel doubt after a mammography
- **Counterfeit**: identification of counterfeit medicine in luggage or parcels
- **Security**: in luggage (cabin or hold) or parcels
  - Detection of explosives: solid (TNT, TATP) or liquids (nitromethane, H<sub>2</sub>O<sub>2</sub>)
  - Detection of narcotics
- **Nondestructive Testing**: detection of metal stress

## What's new?

- **New detector technology** based on room temperature semiconductor crystal (CdTe/CZT) combined with optimized low noise front-end electronics to provide high energy resolved EDXRD spectra.
- **Simulation package** DERIX-lab, capable of modeling the whole diffraction chain (including geometry, collimators, detectors, diffraction physics) to dimension any new EDXRD system.
- Specific detector-level and spectrometric material discrimination **processing methods** (algorithms) to provide the signature of each material with the best accuracy.
- **Experimental EDXRD lab bench**, with flexible geometry (collimation, angle, distances).

## CEA-Leti's results



## What's next?

- **Medical:** test with real biological tissues
- **Counterfeit:** test of drug counterfeit in real settings with customs services
- **Security:** enhance sensitivity with a more open spiral

## Publications & communications

*D. Barbes and al, "Material-specific imaging system using energy-dispersive X-ray diffraction and spatially resolved CdZnTe detectors with potential application in breast imaging", in Nuclear Instruments and Methods in Physics Research, Volume 848, 11 March 2017, pages 91–98.*



## Interested in this technology?

Contact:  
**Loick Verger**  
[loick.verger@cea.fr](mailto:loick.verger@cea.fr)  
 +33 438 785 972

CEA-Leti, technology research institute

17 avenue des Martyrs, 38054 Grenoble Cedex 9, France  
[cea-leti.com](http://cea-leti.com)

@CEA-Leti

Research  
for industrial  
innovation