



# THz imaging

Array detectors in the THz waveband based on antenna-coupled microbolometers (320 × 240 pixels)

## What is CEA-Leti's THz device?

Building on its thermal infrared bolometric technology, CEA-Leti developed smart detectors that enable THz real-time imaging in the most effective way, similar to visible-light digital cameras. CEA-Leti's THz imaging technology is unique. It relies on a patented bolometer architecture in which optical collection is provided by crossed bow-tie antennas combined with a quarter-wavelength dielectric cavity.

THz waves collected by these antennas are then converted into heat and detected by a thermo-resistive layer derived from CEA-Leti and Lynred's mature bolometer technology.

## Applications

THz radiation can translate into various commercial applications:

- **Non-destructive testing for various industrial fields:** food/agriculture, pharmaceutical products, semiconductors, automotive, etc.
- **Defense and security:** people screening, luggage control, etc.
- Remote **spectral analysis** in waste sorting or cultural-heritage diagnosis.
- **Biology and medicine**—dermatology, biochips, etc.

## Key advantages

- Room temperature operation, compactness and video output
- Full compatibility with silicon technology manufacturing process
- Low-cost and high production yield
- Broadband spectral absorption
- Millimetric or submillimetric resolution
- May be customized with innovative pixel and array architecture: frequency range, polarization, etc.

## Key figures

- Large format: 320 × 240 pixels
- Pixel pitch: 50  $\mu\text{m}$
- Spectral range: 0.3 THz-4THz (optimized for 1-3 THz)
- NEP @2.5 THz: 20 pW
- Frame rate: 25 Hz

## THz radiation

Terahertz (THz) band loosely denotes the spectral region 0.3-10 THz (1 mm - 30  $\mu\text{m}$ ). Electromagnetic waves in this band uniquely combine very interesting properties:

- **Sees through matter:** penetration through non-polar materials such as fabric, ceramic, plastic, leather and cardboard.
- **Monitors water content:** high sensitivity to polar molecules.
- **Identifies materials like chemicals, explosives, etc.:** specific spectral signatures of many gases, liquids and solids.
- **Safer than X-ray:** low-energy, non-ionizing radiation.

## How do we work together?

### Proof of feasibility

Optical characterization of samples  
Theoretical signal-to-noise assessment

### Design of a system prototype

Dedicated to your application

### Performance assessments & lab validation

Tests of samples in lab set-up

### Prototype fabrication & tests

Tests of samples in lab set-up



▲ THz tomography of a screw inside a piece of teflon

## Interested in this technology?

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