

**leti**  
cea tech

# IMAGING SENSORS & SYSTEMS

Imagine future imaging...



Leti, technology  
research institute

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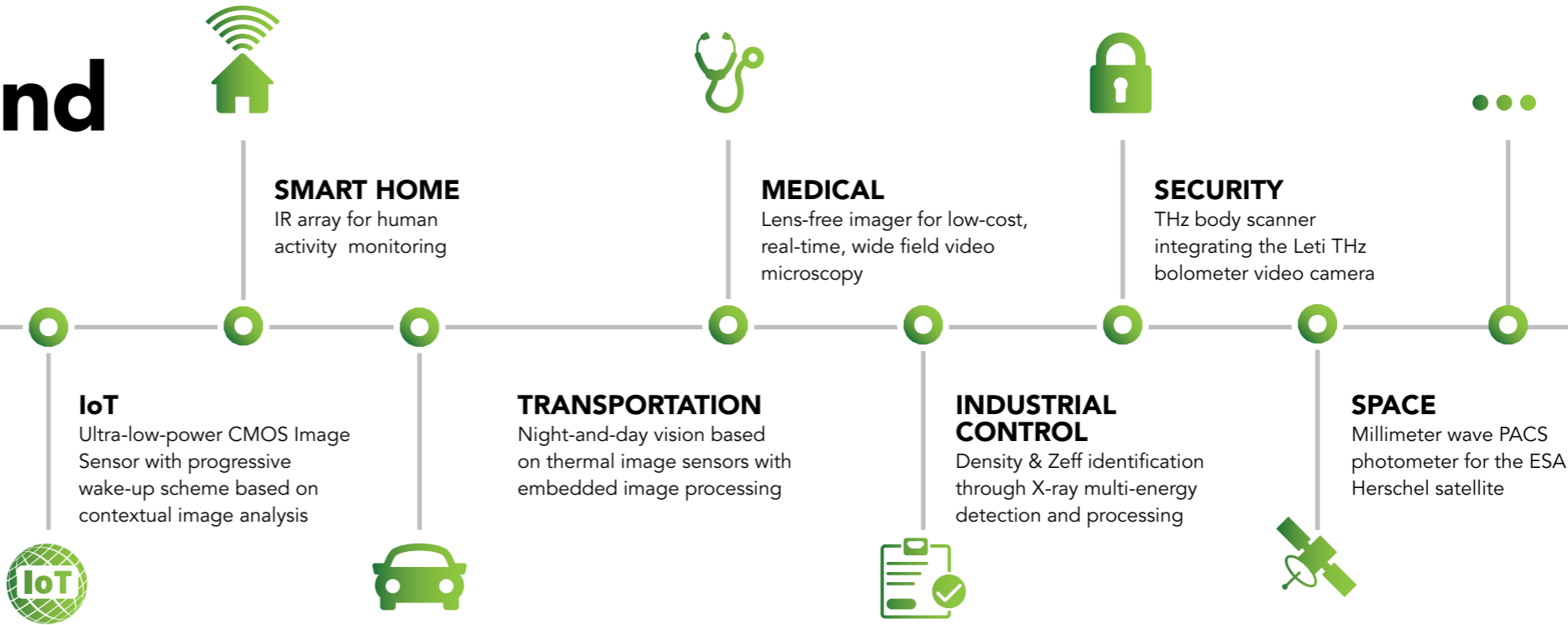


# From consumer markets to high-end applications

There's a boom in video and imaging applications for use in industry and everyday life. However, innovations are continually expected to meet the challenges of industry and society.

Smarter machine-vision systems can assist decision-making and, in turn, raise productivity. Low-cost imaging platforms that monitor human activity without privacy issues are valuable in improving building safety and energy management. More sensitive X-ray imagers reduce medicinal doses delivered to the patient and real-time image systems scanning crowds at railway stations and airports make public transportation safer. It is almost impossible to imagine tomorrow's world without video and imaging technologies.

Leti mobilizes more than 30 years' experience in imaging sensors and systems to develop technological solutions that equip a wide range of applications across both commercial (automotive, consumer, etc.) and high-end (aerospace and defense, health, etc.) markets.



# LETI'S VISION

REFLECTS YOUR DEMANDS,  
CUTTING EDGE TECHNOLOGICAL TRENDS  
ARE GUIDING LETI'S IMAGING R&D



## 2D VISION

There's a common trade-off between performance and SWAP-C or minimized Size, Weight, Power and Cost. Leti's research into multiple technological bricks targets two guiding principles: a continuous focus on market needs and on the functions offered by an image-based product. Many applications implement a combination of these technological bricks.

### PERFORMANCE

- sensitivity
- dynamic range
- resolution
- frame rate

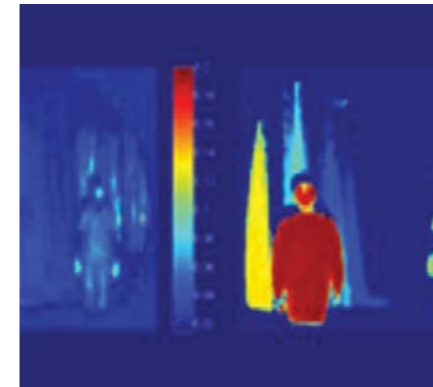
### SIZE, WEIGHT, POWER AND COST

- pixel pitch
- low-power... self-powered
- advanced embedded processing

#### For example:

Advanced driver assistance system (ADAS) functions in automotive applications require imaging sensors that must simultaneously meet the cost constraints of this very competitive market and high-performance characteristics such as robustness and high dynamic range.

## BEYOND EYE-VISION



### 3D VISION

3D imaging from X-ray to far-infrared wavelengths is a key technology in transport, robotics, drone engineering, gesture recognition, non-destructive testing (e.g. X-ray tomography), augmented reality and medical imaging.

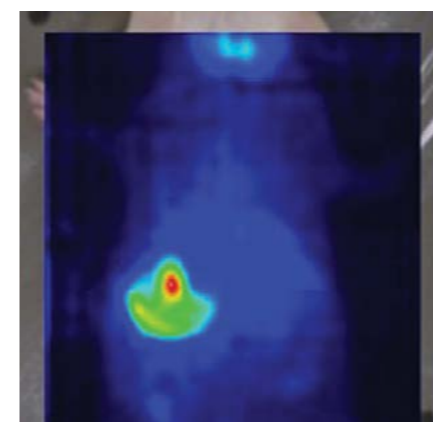
- visible and infrared time-of-flight monolithic sensors
- X-ray tomography



### MULTICOLOR / MULTI-ENERGY

Multispectral and hyperspectral imaging captures the unique fingerprint of the sample under test. These processes can provide vital information in multiple applications within the food inspection, agriculture, wellness, health, cosmetics non-destructive testing, machine vision and many other sectors.

- hyperspectral cmos image sensors with filtering at the pixel level
- multi-energy X-ray sub-systems
- multispectral infrared arrays



### ADVANCED IMAGING SYSTEMS

Advanced imaging systems are favored, when the image sensor is integrated into complex architecture combining hardware and software. This trend is perfectly exemplified by imaging for machine vision in Cyber Physical Systems (CPS), which implies functions additional to the vision sensor such as energy harvesting or event-based detection. Other examples are lens-free imaging, microscopy, fluorescence, IR, computed tomography and thermography.

- advanced functions
- computer vision
- machine learning
- adaptative resolution
- time resolved diffuse optical tomography

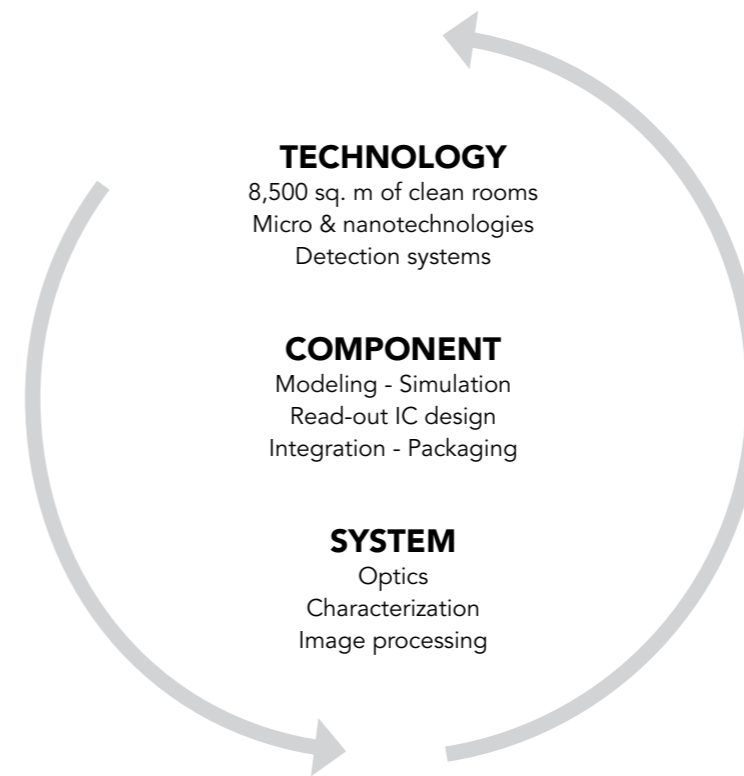


# LETI'S OFFER

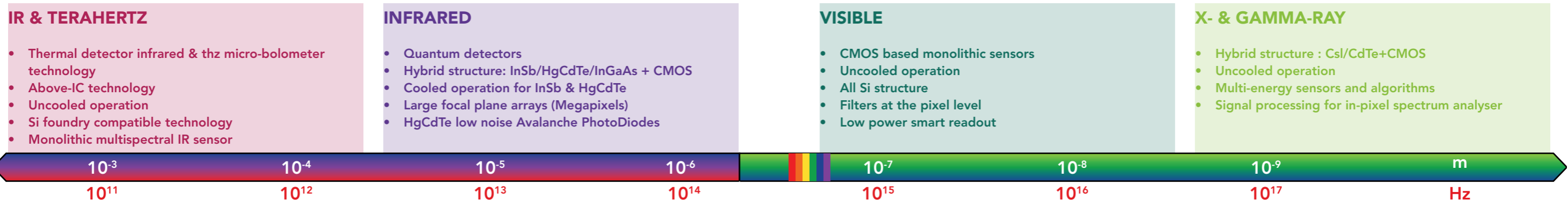
FROM THZ  
TO X & GAMMA-RAYS...

For over 30 years, Leti has been extending its know-how throughout the imaging chain in cooperation with leading manufacturers. Development has ranged from growth of base materials to characterization of final image systems and has included integration of optics and advanced wafer functions. Leti's multidisciplinary know-how ensures innovation in sensors, vision modules and systems to meet challenges raised by every stakeholder from component manufacture to end user. Our R&D projects embrace every aspect of modeling, designing, prototyping and testing image sensors and systems.

Based on strong interactions with Leti's experts in imaging technologies, a design team can ensure every development aspect from the CMOS read-out circuit close to the pixel signal to advanced embedded software.



...FROM MATERIALS  
TO SYSTEM



### THERMAL IMAGE SENSORS

Infrared cameras—to keep an eye on city streets or factories, or help drivers see better at night—use bolometric imagers.

Leti has been developing bolometric imagers since 1992. It transferred the technology to Ulis in 2002.



### MCT DETECTORS

Leti is working with Sofradir on infrared imagers: the best for detecting infrared radiation emitted by the human body and other heat-emitting objects. MCTs are used in military night-vision systems, on weather satellites and space probes and in industrial and commercial applications.



### A HIGH-END PHONE CAMERA

STMicroelectronics and Leti have cooperated for several years on technologies leading to a boom in imaging applications for mobile telephones. Leti provided STMicroelectronics with a Through-Silicon-Via (TSV) technology brick and processes to make thinner imager retinas and boost photon collection efficiency.



### ME100 SPECTROMETRIC DETECTOR

Leti mobilized its medical radiographic know-how (including spectrometer, X- and gamma-ray measurement and data processing) to improve baggage-screening system performance. MultiX's system uses a detector and spectrum data-processing method developed specifically for baggage screening.





## ABOUT LETI

**Leti is a technology research institute at CEA Tech and a recognized global leader in miniaturization technologies enabling smart, energy-efficient and secure solutions. Committed to innovation, its teams create differentiating solutions for Leti's industrial partners.**

By pioneering new technologies, Leti enables innovative applicative solutions that ensure competitiveness in a wide range of markets. Leti tackles critical, current global issues such as the future of industry, clean and safe energies, health and wellness, safety & security...

Leti's multidisciplinary teams deliver solid micro and nano technologies expertise, leveraging world-class pre-industrialization facilities.

For 50 years, the institute has been building long-term relationships with its industrial partners providing tailor-made solutions and a clear intellectual property policy.

**Leti, technology research institute**

Commissariat à l'énergie atomique et aux énergies alternatives

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