

cea

leti



# Physiolas

PATENTS  
10+  
PATENTS

## Listening to molecules: miniaturized photoacoustic sensors for non-invasive biomarker monitoring

### What it is

These new-generation photoacoustic sensors combine laser sources emitting in the mid-infrared range with a photoacoustic cell and integrated microphones. Molecules of interest absorb the light emitted by the laser sources in a unique way, generating acoustic waves that can be used to measure molecule trace concentrations.

This exclusive CEA-Leti technology can be miniaturized to the extreme and is compatible with volume manufacturing. It opens the door to selective real-time monitoring of biomarkers, including glucose, and of certain gases in the environment.

### What it can do

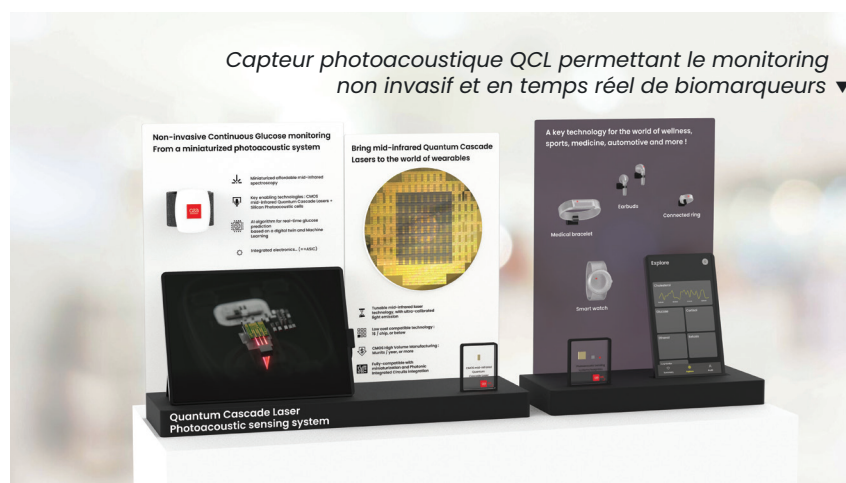
This technology and the associated silicon CMOS and MEMS low-cost volume manufacturing processes address several markets:

- **Sports, health, nutrition, and wellness:** real-time monitoring of multiple biomarkers with a connected, non-invasive wearable device
- **Medical:** real-time glucose monitoring with a non-invasive wearable device that has already been clinically tested
- **Environment, industrial process control, and quality control:** gas emissions monitoring with a connected stand-alone device
- **Safety:** screening for toxic substances to comply with future transportation-industry standards

## What makes it unique

This mid-infrared spectroscopy technique is still little-used outside of laboratory environments at the state of the art due to the cost and size of the equipment. CEA-Leti's innovative concept promises to remove the barriers that have prevented the wider-spread use of current solutions. CEA-Leti brings years of research and development spanning the miniaturization and integration of photonic components on silicon, advanced software, digital twins, and machine learning to this innovation.

- Mid-infrared quantum cascade lasers and photoacoustic cells manufactured using CMOS and MEMS technology, respectively, guaranteeing rapid transfer to a commercial fab for volume markets
- Compatible with volume manufacturing at a cost of \$1 per CMOS laser (or less in some cases) and less than \$10 per sensor



## Working with CEA-Leti

This technology is ready to be developed and industrialized for partners. Companies of all types and sizes can work with CEA-Leti on projects across the entire value chain through single-partner R&D contracts or multi-partner affiliate programs. CEA-Leti's mission is to bring this breakthrough technology to the market as quickly as possible, enabling new capabilities for next-generation products. And, with CEA-Leti's "lab-to-fab" model, each project is supported until the technology is ready for transfer. Finally, CEA-Leti brings a "compliant by design" approach to developments for medical devices. The institute's knowledge of the regulatory environment ensures that end products are ready for commercialization.

### CEA-Leti, technology research institute

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

@CEA-Leti

## Key figures

- An extremely miniaturizable ( $<1 \text{ cm}^3$ ) low-cost system ( $<\$10$  each), with medical performance demonstrated in a second clinical trial.
- Very promising results were obtained in representative in-home testing: MARD (Mean Absolute Relative Difference) of around 18% for non-invasive continuous glucose measurement, placing clinical validation within reach.

## Scientific publication

Coutard, J.G. et al. (2024). "Neogly™ QCL-based NI-CGM medical device". Proc. SPIE 12838, Biophotonics in Exercise Science, Sports Medicine, Health Monitoring Technologies, and Wearables V, 1283802.

## Interested in this technology?

Contact:  
**Vincent Destefanis**  
[vincent.destefanis@cea.fr](mailto:vincent.destefanis@cea.fr)  
 +33 660 908 508