

# BACRAM

## CULTURE-FREE BACTERIAL ANALYSIS IN LESS THAN 15 MIN

### + WHAT IS BACRAM?

CEA-Leti introduces BACRAM, the first compact and culture-free technology that identifies microorganisms in less than 15 min. BACRAM leverages:

- A custom multimodal instrument combining imaging modalities—lensfree imaging and darkfield microscopy—with a Raman analyzer, based on a confocal arrangement. Lensfree imaging enables wide field-of-view detection, while darkfield microscopy ensures easy targeting of single bacteria cell. Raman spectra are recorded in 10 sec.
- A database filled with Raman spectra of the most relevant bacteria depending on the application.
- A classification algorithm based on a hierarchical decision structure with an evaluation of the decision's reliability at each stage.
- An automatic software allowing unknown spectra visualization, and providing the results of bacteria identification.

### + APPLICATIONS

BACRAM can be used for:

- Pathogen threat detection in the context of Chemical, Biological, Radiological and Nuclear (CBRN) risks
- Point-of-care diagnosis for human medicine
- Environmental monitoring—air, water, etc.
- Industrial process monitoring

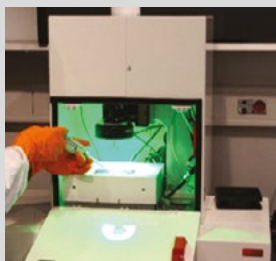
## + WHAT'S NEW?

BACRAM offers many new features, including:

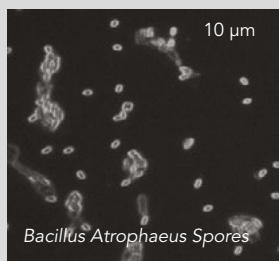
- Rapid identification of bacteria in less than 15 minutes: no culture growing step, label-free, single cell analysis
- Transportable system compatible with field operation and associated constraints. The system can be used in first response vehicles, as well as in mobile laboratories or microbial safety workbenches.
- Specific identification at the species level—identification at the strain level possible
- A classification algorithm that can adapt to the variability of biological or environmental samples

## MAIN PUBLICATIONS

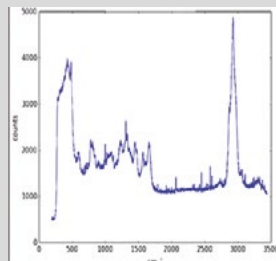
- Strola et al., "Single bacteria identification by Raman spectroscopy", JBO, 19(11), 111610 (2014)
- Baritoux et al., "A study on identification of bacteria in environmental samples using single-cell Raman Spectroscopy: feasibility and reference libraries", Environ. Sci. Pollut. Res (2016) 23:8184-8191



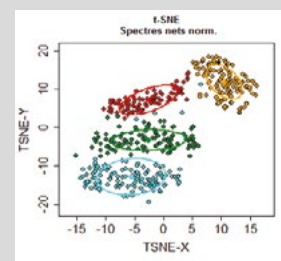
Instrument



Wide field of view microscopy (localisation of bacteria)



Raman spectra of a single bacterium



Automatic software for identification of bacteria (classification algorithms)

## + WHAT'S NEXT?

This technology is already available for pathogen threat detection in the context of Chemical, Biological, Radiological and Nuclear (CBRN) risk. CEA-Leti is currently working on further developments for new applications in human medicine, industrial process monitoring and Raman label-based techniques.

BACRAM may also be leveraged as a part of a global analytical chain, including sample collection, preparation and analysis.



## INTERESTED IN THIS TECHNOLOGY?

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