# 24 months Postdoctoral Researcher
# Terahertz Spectrsocopy of Proteins

**(~35 000 €/year gross salary) funded by an ERC consolidator grant**

**Context and objectives:** **Exploring Proteins Structure with THz nanotechnology**

Proteins perform essential functions in living organisms, from oxygen transport to photosynthesis. Their intricate nano-structure dictates their function, and modifications to this structure can have devastating consequences, as seen in diseases like Alzheimer's and Parkinson's. This underscores the need for techniques capable of probing protein nano-structure. Existing techniques often face limitations in realistic environments and conditions.

Vibrational spectroscopy in the Terahertz (THz) range offers a promising alternative. Analogous to how musical instruments produce sounds based on their size, the frequency of vibrations in proteins corresponds to nanometric sizes in the THz range.

The research fellow will build on our prior work (se figure 1), using our developed devices to analyze biological material from amino acids to protein microcrystals. Using a dedicated cryostat, you will explore the vibrational properties of proteins from 4K to body temperature.

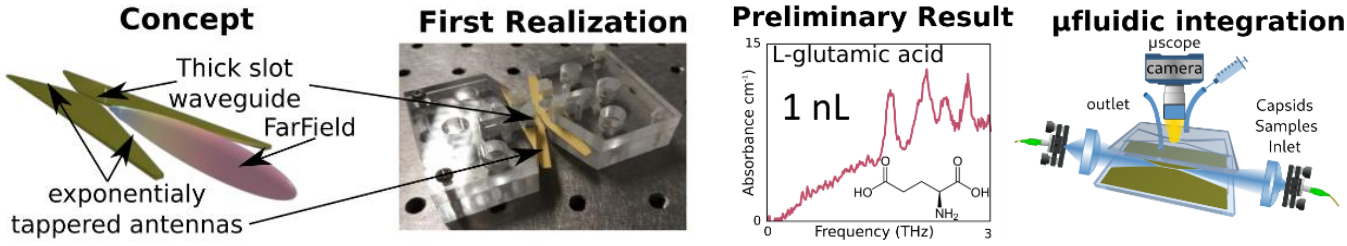


*Figure 1: left, schematic of the butterfly device, and first realization, record spectrum of amino acids and future improvements.*

THz spectroscopy probes matter non-invasively, making it valuable for identifying materials, especially biological samples. THz waves can study the structure and dynamics of biological molecules, including proteins, DNA strands, viral capsids, cells, and bacteria. However, the study of biological samples in their natural state is limited by their small size preventing decent interaction with a propagating THz photon. Our group has developed THz devices based on metallic hollow waveguides to overcome limitations due to the, showing promising results. The ERC-funded TUSCaNy project aims to explore the hidden world of biological molecules with dedicated THz technology.

**Key Responsibilities:**

Your main mission will be to lead spectroscopic experiments and their analysis. You will validate concepts on known spectral lines of amino acids in micro-sized samples using THz spectroscopy from 4K to body temperature, first on pellets and then comparing results on micro samples using our devices. You will extend this to protein samples, ranging from cryogenic temperatures to microfluidic environments. Your ultimate goal is to obtain high-quality data to better understand the structures and functions of biological molecules.

**Environment:**

Our team at the IEMN Laboratory in Lille, France, offers a dynamic environment for cutting-edge research in the THz range. As part of our THz-Photonics group, you will have access to state-of-the-art nano fabrication facilities in our 1500m² clean room and fully equipped experimental facilities. With our expertise in THz optoelectronic devices, you will design and conduct innovative THz biophotonics experiments.

**Candidate Requirements:**

We are seeking a Ph.D. holder in material science, physics, or a related field, with expertise in experimental spectroscopy, optics, data processing and analysis, or Python coding. The exact tasks will be tailored to your capacities and interests, and we encourage you to contact us to learn more about this exciting opportunity!

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- Hold a Ph.D. in material science, physics, or a related field.
- Expertise in experimental spectroscopy, optics, data processing and analysis, or Python coding.
- Experience in Terahertz technology and spectroscopy is a plus.

**Key words:** light-matter interactions, *TeraHertz, spectroscopy, phonon.*

**Contact:** Interested candidates should submit their CV, a cover letter outlining their research experience and interests, and contact information for two references to Dr. Romain Peretti at romain.peretti@cnrs.fr.

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