Postdoc position in optics for life sciences
12 months (extendable to 24 months)
Funded by ANR POROTUME, 2300€ per month net salary
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Development of a spectrometer for quantitative imaging of live cancer tissues with Brillouin light scattering

Micro-Brillouin spectroscopy allows characterizing the viscoelastic properties by measuring the hypersonic waves propagating within the tissue. This non-invasive optical method has been recently used to study osmotic shocks in single cells, or to map mouse cornea.[1,2] These results have been obtained using a new type of spectrometer called virtual image phased array (VIPA), allowing the acquisition of a single spectrum in a few seconds.

With our team in Lyon, we have performed studies using a Fabry-Pérot Tandem spectrometer, enabling a very high spectral resolution that provides essential information on the viscoelasticity of the tissue or cell. We have in particular demonstrated that such measurements can reveal the in-depth efficacy of a clinical therapy on live tumours. However, this spectral quality is obtained at the expense of the acquisition time (> 100sec per spectrum), thus limiting the production of large images, which are essential for the statistical analysis of biological samples.

The objective of this postdoc will be to design, build and characterize a VIPA spectrometer that will complement the existing Fabry-Pérot spectrometer. The postdoc will have to carry out the optical assembly and implement the acquisition on biological tissues models. This work will be supported by the expertise in photonics and biophysics of the host teams. Finally, she/he will couple the two spectrometers on the same microscope in order to compare their respective potentials (spectral resolution, rapidity, etc.) on real biological systems (tumour models and xenografts) designed in the laboratory by our collaborators.

The candidate will also support the other projects of the team on optoacoustics, and supervise the PhD students involved. These approaches use pulsed lasers to generate ultrasound in the same biologicals used for Brillouin imaging and are thus complementary.

Local collaborative network : The postdoc will work at ILM in the Biophysics and SOPRANO teams. She/he will be supervised by Thomas Dehoux and Jérémie Margueritat. The biomedical part (sample preparation and data interpretation) will be developed in collaboration with Hichem Mertani from the team Nuclear Domains and Pathologies at the Cancer research Center of Lyon.

Candidate background: The candidate will have a PhD in Physics/Engineering with an emphasis on the development of optical instruments. We expect academic achievement in terms of publication in this domain. Skills in spectroscopy, optoacoustics or microscopy will be greatly appreciated. Also, experience at the interface between physics and biology will be an advantage.

Keywords : optics, photonics, biophysics, biomedical optics, optoacoustics

1. Scarcelli, G. et al. Noncontact three-dimensional mapping of intracellular hydromechanical properties by Brillouin microscopy. Nat. Methods **12**, 1132–1134 (2015).
2. Scarcelli, G. & Yun, S. H. Confocal Brillouin microscopy for three-dimensional mechanical imaging. Nat. Photonics **2**, 39–43 (2008).