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Institut d'Electronique, de Microélectronique et de Nanotechnologie
UMR CNRS 8520

Master or Engineer internship 2025-2026

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Title: **Open-Top Light-Sheet Microscope for deep microtumor imaging**

Abstract:

In Light-Sheet Microscopy, a thin layer of light passes through a sample, illuminating only one slice at a time. This renders 3D fluorescence imaging fast, avoids background illumination and reduces photodamage compared with methods such as point scanning microscopy. Two-photon excitation is preferred because it increases penetration depth. In thick, scattering samples, **two-**photon light-sheet is the current gold standard for live imaging of biological specimens.

However, most light-sheet setups are built around the sample (tanks, special holders, complex access), which makes handling, stimulation, and long-term experiments inconvenient. Here, we will build a new open-top two-photon light-sheet microscope to monitor living micro-tumors over long period of time. We will also leverage the inherently high speed of light-sheet acquisition to monitor multiple samples to improve statistical power and repeatability—to our knowledge, such open-top configuration does not yet exist. The open-top layout keeps the optics below the sample, leaving the top fully accessible for adding chemical stimuli and monitor the dynamic biological response.

You will implement a fully automated procedure to calibrate sample positioning for our open-top light-sheet strategy. You will characterize resolution and penetration depth in scattering media. You will use the microscope to image tumoroids and organoids and compare it with state-of-the-art techniques. If times permits, you explore spatial modulation to further improve penetration depth.

Key words: Light-sheet Optical Microscopy; Biophysics