



POLITECNICO
MILANO 1863

Supervisor Expression of Interest MSCA - Marie Skłodowska Curie Action - (PF) Postdoctoral Fellowship 2024

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Department Name: Physics

Research topic:

- MSCA-PF Research Area Panels: CHE_Chemistry
- ECO_Economic Sciences
- ENG_Information Science and Engineering
- ENV_Environmental and Geosciences
- LIF_Life Sciences
- MAT_Mathematics
- PHY_Physics
- SOC_Social Sciences and Humanities

Brief description of the Department and Research Group:

The research will be carried out at the Nonlinear Optical Microscopy Lab “VIBRA” (www.vibra.polimi.it), at the Physics Department (www.fisi.polimi.it/en) of Politecnico di Milano. It is equipped with state-of-the-art optical instrumentation, comprising several ultrashort pulsed lasers and four microscopes for linear and nonlinear imaging via different techniques (spontaneous and coherent Raman, including both broadband CARS and SRS, SHG, 2PEF, Brillouin...).

The Physics Department comprises 50 faculty members, 15 technical and administrative staff people, 80 PhD students and a number of PostDocs. The research activities of the Department are mainly experimental and focused on the two broad areas of Photonics and Nanotechnologies. The Physics Department has a long history and tradition in laser science and hosts more than 10 independent optics/photonics laboratories, mainly dedicated to ultrafast, nonlinear and biomedical optics.

TITLE of the project: Label-free optical microscopy of cells and tissues

Brief project description: Spontaneous Raman Spectroscopy is a well-known technique to perform a detailed molecular analysis of a biological sample. However, the intrinsic slowness of the technique prevents a real-time imaging of the samples. Coherent Raman Microscopy (CRM), reaches video-rate imaging but with a limited chemical selectivity at a single vibrational frequency. The aim of this research is to develop an innovative multimodal microscope for not only broadband CRM, combining high-speed acquisition with multifrequency (broadband) analysis, but also second-harmonic generation (SHG) and two-photon excited fluorescence (2PEF). Applications are mainly focused on biological samples such as cells and tissue sections, to unravel the subtle mechanisms responsible for the molecular origin of diseases such as cancer.