POLITECNICO DI MILANO

PhD in FISICA / PHYSICS - 38th cycle

THEMATIC Research Field: ADVANCED PHOTONICS FOR SPECTROSCOPY AND IMAGING APPLIED TO IN VIVO DIAGNOSTICS AND MICROSCOPY (I-PHOQS BIOPHOTONICS)

Monthly net income of PhDscholarship (max 36 months)
€ 1195.5 In case of a change of the welfare rates during the three-year period, the amount could be modified.

Context of the research activity	
Motivation and objectives of the research in this field	The aim of this PhD project, in the framework of the Italian I-PHOQS infrastructure, is the development of advanced photonic workstations for non-invasive multi-functional spectroscopy and tomography in clinical in vivo diagnostics as well as for high resolution multidimensional imaging of biological samples from microscopic (¿m) to mesoscopic (mm-cm) scale.The goal of the research is to push photonics technologies beyond the state-of-the-art to provide unique instrumentation with top-class performances, open to access to external users for frontier research in biomedicine.
Methods and techniques that will be developed and used to carry out the research	The PhD candidates will be involved in either of the following activities: - Multifunctional Time-Domain Diffuse Optical Tomography for deep (cm) optical tomography on humans for non-invasive reconstruction of 4 functions: (i) microvascular blood flow (TD-DCS); (ii) deep spontaneous Raman emitters (TD-DIRS); (iii) cerebral hemodynamics (TD-fNIRS); (iv) tissue composition and novel biomarkers (TD-BROAD). - Platform for high resolution fluorescence multidimensional imaging to perform structural, molecular and metabolic analysis of cells and biological tissues at high spatio-temporal resolution: (i) high-throughput molecular imaging (LSFM);

	(ii) functional/metabolic imaging (FLIM) All workstations show a strong integration of hardware and software components opening the facility also to researchers studying novel computational imaging algorithms.
Educational objectives	The PhD candidate will receive a multidisciplinary training in topics including lasers, detection techniques at the single-photon level, optical microscopy and tomography, study of photon migration through biological tissues, image reconstruction and analysis of biological signals. He/she will be exposed to the steps required for the development, validation and use of complex photonics instrumentation for next-generation biomedical diagnostic techniques.
Job opportunities	The candidate will be exposed both to the greatly growing field of health technologies and to the vibrant area of photonics with strong multidisciplinary attitude, well apt to find job opportunities in high-tech industries and medical centers. Furthermore, he/she will gain useful experience for a potential future career in the academia or in research centers.
Composition of the research group	4 Full Professors 4 Associated Professors 3 Assistant Professors 7 PhD Students
Name of the research directors	Pifferi, Torricelli, Taroni, Bassi, D'Andrea

Contacts
Prof. Antonio PifferiPintonio.pifferi@polimi.it *Prof. Alessandro Torricelli: alessandro.torricelli@polimi.it* *Prof. Paola Taroni: paola.taroni@polimi.it* *Prof. Andrea Bassi: andrea1.bassi@polimi.it* *Prof. Cosimo D'Andrea: cosimo.dandrea@polimi.it* *https://www.fisi.polimi.it/it/ricerca/strutture_di_ricerca/linee_di_ricerca/49519.*

Additional support - Financial aid per PhD student per year (gross amount)	
Housing - Foreign Students	--
Housing - Out-of-town residents (more than 80Km out of Milano)	--

Scholarship Increase for a period abroad	
Amount monthly	597.75 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information

Educational activities (purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences): financial aid per PhD student per 3 years: max 4.872,90 euros.

Teaching assistantship:There are various forms of financial aid for activities of support to the teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

Computer availability: individual use.

Desk availability: shared use.