



PhD in FISICA / PHYSICS - 37th cycle

THEMATIC Research Field: COHERENT RAMAN MICROSCOPY

Monthly net income of PhDscholarship (max 36 months)

€ 1200.0

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 research activity is part of the projects *CRIMSON* from H2020 (*Disruptive photonics technologies* call id ICT-36-2020, grant agreement n. 101016923), *NEWMED* from Regione Lombardia (POR FESR 2014-2020) and programme HORIZON-EIC-2021 *CHARM* n. 101058004. 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). See www.vibra.polimi.it

Methods and techniques that will be developed and used to carry out the research

- 1) Generation of suitable narrowband ps and broadband fs pulses via non-linear optics;
- 2) radiation-matter interaction in CRM, SHG and 2PEF microscopy;
- 3) advanced instrumentation (beam scanning, detection, control);
- 4) multivariate statistical analysis;
- 5) biological applications, from cells to tissues.

Educational objectives

The candidate will gain specific skills in the design of a complete multimodal CRM instrument, which will be used in collaboration with biologists for the study of cells and



	tissues.
Job opportunities	The skills acquired during this research project will give the opportunity of a career in industrial companies oriented to the R&D of innovative laser systems, spectroscopic instruments and microscopes, as well as in bio-photonics labs and industries.
Composition of the research group	1 Full Professors 2 Associated Professors 2 Assistant Professors 3 PhD Students
Name of the research directors	prof. Dario Polli

Contacts	
Prof. Dario Polli (see http://polli.faculty.polimi.it/) Email: dario.polli@polimi.it Webpage: http://polli.faculty.polimi.it/ Tel number: 02.23.99.60.86 www.vibra.polimi.it	

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	564.01 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information	
<p>Educational activities per year : 1st year: 0 2nd year: 1534 euros per student 3rd year: 1534 euros per student. or 1022 euros per student for each year.</p> <p>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</p>	



regulations.

Computer and Desk availability: shared use