



PhD in FISICA / PHYSICS - 39th cycle

THEMATIC Research Field: DEVELOPMENT OF NON-LINEAR STRUCTURED ILLUMINATION ULTRAFAST MICROSCOPY

Monthly net income of PhDscholarship (max 36 months)

€ 1300.0

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 is funded by Project ERC-StG HOLOFAST n. 101117858 developed in IFN-CNR. In several promising optoelectronic materials nanoscale morphology is known to be deeply connected to photophysical processes. Ultrafast microscopes are restricted to single point illumination or very small fields of view, lacking the large sample area coverage needed to place observations in their proper statistical context. Moreover, they are generally incompatible with super-resolution imaging, preventing the required nanoscale spatial resolution from being achieved. In the context of HOLOFAST, the student will develop nonlinear structured illumination to add super-resolution to a transient holographic microscope recently introduced in our group. The student will apply the microscope to the study spatio-temporal kinetics on ultrafast timescales of several new materials, such as hybrid perovskites and lateral heterojunctions of transition metal dichalcogenides.

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

The student will first work on the implementation of an off-axis holographic microscope based on femtosecond pulses, and then develop nonlinear structured illumination microscopy, which will finally be applied to the study of spatio-temporal phenomena where morphology and photophysics are connected. The student will also complement these data with other ultrafast and nonlinear spectroscopy techniques, such as transient absorption and multidimensional electronic spectroscopy.



Educational objectives	The scholar will receive multidisciplinary training in topics including nonlinear optics, ultrafast spectroscopy, nonlinear microscopy, off-axis holography and the physics of condensed matter. He/she will have the opportunity to visit partner laboratories in Italy and abroad.
Job opportunities	Due to the multidisciplinary training in cutting edge techniques of optics, photonics, solid-state physics and nanoscience, as well as the required data analysis, the scholar will have excellent job opportunities in high-tech industries. In addition, he/she will be well positioned for an academic career.
Composition of the research group	1 Full Professors 3 Associated Professors 2 Assistant Professors 5 PhD Students
Name of the research directors	Franco V.A. Camargo

Contacts	
franco.camargo@cnr.it	
+39-02-23996113	
https://ifn.cnr.it/people/franco-camargo/	

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	650.0 €
By number of months	6

Additional information: educational activity, teaching assistantship, computer availability, desk availability, any other information	
Educational activities Educational activities (purchase of study books and material, funding for participation in courses, summer schools, workshops and conferences). Financial aid per PhD student per 3 years: max 5.300,25 euros per student.	
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