



PhD in FISICA / PHYSICS - 39th cycle

THEMATIC Research Field: TIME-DOMAIN INVESTIGATION OF DEFECTS IN TWO-DIMENSIONAL SEMICONDUCTORS

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 HE Pathfinder Open QUONDENSATE n. 101130384. Atomically thin two-dimensional semiconductors such as transition metal dichalcogenides (TMDs) have been the subject of vigorous experimental and theoretical study over the last ten years due to their unique physical properties. They host strongly bound excitons and display spin/valley selectivity. Defects in TMDs behave as quantum single-photon emitters and can be used to implement novel forms of quantum computation. In the framework of the QUONDENSATE project, the fellow will study the electronic and optical properties of defects in TMDs which can act as nodes in a neural network to be used for quantum reservoir computing. To this end, the fellow will utilize several sophisticated experimental setups for laser spectroscopy and microscopy which are available at the Physics Department of Politecnico di Milano, and which will be further developed and applied by the scholar.

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

The fellow will work on the application of sophisticated ultrafast and nonlinear spectroscopy (such as transient absorption and multidimensional electronic spectroscopy) and microscopy (hyperspectral microscopy, widefield multiplexed holography) techniques to the study of cutting-edge problems in 2D semiconductors. Particular focus will be given to the characterization of quantum single photon emitters created within nanosheets of 2D semiconductors



Educational objectives	The scholar will receive multidisciplinary training in topics including nonlinear optics, ultrafast spectroscopy, nonlinear microscopy, 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 and photonics as well as solid-state physics, quantum computing and nanoscience, 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	Giulio Cerullo

Contacts	
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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
<p>Educational activities: 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 5.300,25 euros per student.</p> <p>Teaching assistantship: There are various forms of financial aid for activities of support to the</p>



teaching practice. The PhD student is encouraged to take part in these activities, within the limits allowed by the regulations.

Computer and desk availability: individual or shared use computer and desk.