



PhD in FISICA / PHYSICS - 39th cycle

THEMATIC Research Field: ULTRAFAST SPECTROSCOPY OF LIQUID WATER AND SOLVATED MOLECULAR SYSTEMS

Monthly net income of PhDscholarship (max 36 months)

€ 1750.0

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

Understanding the dynamics of the ultrafast energy and charge flow in pure liquid water is essential for obtaining insights into the role of water in chemical reactions and biologically-relevant processes occurring in aqueous environments. Charge migration can occur on an extremely fast time scale, ranging from a few tens of attoseconds to a few femtoseconds. This process has been recently investigated using attosecond light sources in biochemically relevant molecules in the gas phase. These pioneering works have paved the way for the possibility of controlling bond formation and bond breaking via a coherent electron excitation, however, a characterization of charge migration in a realistic environment (i.e. water) is still missing. The main goal of the present PhD project is to investigate the ultrafast dynamics and charge transfer processes in liquid water and solvated molecules through ultrafast time-resolved spectroscopy experiments. This research topic is developed in the framework of the participation of CNR to the Center for Molecular Water Science at DESY (Germany).

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

- time-resolved transient absorption in a thin flat liquid jet using few-fs visible and UV pulses;
- Investigation of solvated electron dynamics in water and water solution containing biologically relevant molecules by ultrafast THz spectroscopy;
- Development of a high-intensity off-resonant (< 1 THz) THz-pump.



	Part of the activity will be developed at DESY
Educational objectives	The PhD student will acquire specific competencies in the following fields: strong field physics; attosecond science; atomic and molecular physics; molecular dynamics; ultrafast spectroscopy. They will acquire also several technical competencies: ultrafast laser sources; vacuum technology; advanced programming and data analysis as well as complementary soft skills.
Job opportunities	Post Doc in renewed research institutions working on attosecond science and ultrafast spectroscopy. Career path in the industry (lasers; advanced materials; consultancy).
Composition of the research group	2 Full Professors 5 Associated Professors 4 Assistant Professors 4 PhD Students
Name of the research directors	Caterina Vozzi; Salvatore Stagira; F. Calegari

Contacts	
<p><i>Dr. Caterina Vozzi: Caterina.vozzi@cnr.it;</i></p> <p><i>Prof. Salvatore Stagira: Salvatore.stagira@polimi.it;</i></p> <p><i>Prof. Dr. Francesca Calegari (DESY)</i></p> <p><i>www.udyni.eu</i></p>	

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	875.0 €
By number of months	6

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

Educational activities: Financial aid per PhD student per 3 years: max 7.134,75 euros per student (purchase of study books and material, funding for participation to courses, summer schools, workshops and conferences).

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 and desk availability: 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