

PhD thesis opportunity: Ultrafast electron dynamics in light-matter interactions

Centro de Física de Materiales (CFM) and
Donostia International Physics Center (DIPC),
Donostia-San Sebastián, Spain



Fully Funded | Start Date: Late 2026-Early 2027

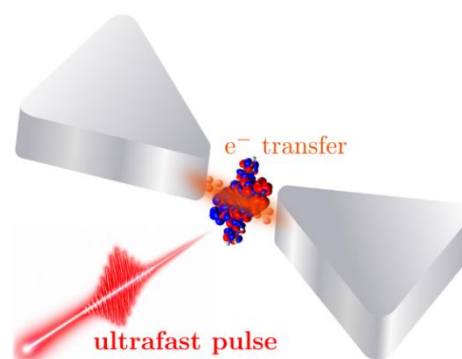
First screening deadline: 22nd October 2026

(Applications accepted until the position is filled)

The **Theory of Nanophotonics Group** at the Centro de Física de Materiales (CFM) and Donostia International Physics Center (DIPC) in **San Sebastián (Spain)** offers a **fully funded PhD position** to explore **light-matter interactions and electron dynamics at the nanoscale**. The project will investigate **charge transfer and photoemission** in metallic nanostructures using state-of-the-art quantum-mechanical approaches. The position offers the opportunity to work in a **world-class research environment** at the forefront of **nanophotonics, quantum technologies, and ultrafast optoelectronics**.

Project Overview

The PhD candidate will focus on the theoretical description of **light-matter interactions and ultrafast electron dynamics in metallic nanostructures**, with particular emphasis on **nonlocal effects, charge transfer, and photoemission**. These phenomena become especially relevant in nanostructures with subnanometric dimensions and gaps, where conventional electromagnetic descriptions may no longer capture the full response. The theoretical work will be primarily based on **Time-Dependent Density Functional Theory (TDDFT)**, enabling a fully quantum-mechanical treatment of electron dynamics and access to both linear and nonlinear optoelectronic phenomena.



The candidate will investigate topics ranging from **nonlocal and nonlinear optical response** to **femtosecond charge-transfer and photoemission processes** in metallic nanocavities and molecule-bridged gaps. The ultimate goal is to develop **realistic and predictive theoretical descriptions of light-driven electron dynamics** in nanophotonic systems and explore their potential for **ultrafast and nanoscale optoelectronic applications**.

The group

The thesis will be supervised by [Javier Aizpurua](#), head of the [Theory of Nanophotonics Group in San Sebastián](#), and [Antton Babaze](#), researcher in the same group. The group offers a **dynamic and internationally recognized research environment**, with broad expertise in theoretical nanophotonics and strong collaborations with leading experimental and theoretical groups worldwide. The project will be carried out in close collaboration with [Andrei G. Borisov](#), CNRS research director, at the Institut des Sciences Moléculaires d'Orsay (Paris, France). More information about our research can be found on the group [website](#) and [Google Scholar](#).

Why This PhD?

- Explore new physics at the **interface of nanophotonics, quantum mechanics, and ultrafast electron dynamics**.
- Master **state-of-the-art computational methods** with applications across nanophotonics and quantum technologies.
- Close interaction with leading **international collaborators**.
- Live and work in San Sebastián, a city with very high standards for quality of life within Europe.

What We're Looking For

We're seeking a motivated and curious candidate with:

- A **Master's degree** (or equivalent) in Physics, Materials Science or a related field.
- Background in **nanophotonics, condensed matter, and computational modelling** highly valued.

To Apply

Please send an application to antton.babaze@ehu.eus with subject line: "PhD ultrafast dynamics":

- **Cover letter** (max. 1 page) explaining your interests and motivation
- **Curriculum Vitae**, including academic transcript
- **Reference letter(s)**