

The Nanoscience Cooperative Research Center, CIC nanoGUNE, located in Donostia / San Sebastian, Basque Country (Spain), is currently looking for a

MASTER STUDENT

to work on

Magnetic and Optical Properties of Atomically Precise Carbon Nanostructures

NanoGUNE is a research center devoted to conducting world-class nanoscience research for a competitive growth of the Basque Country. NanoGUNE is a member of the Basque Research and Technology Alliance ([BRTA](#)) and is recognized by the Spanish Research Agency as a *María de Maeztu* Unit of Excellence.

The position is offered in the **Quantum-Probe Microscopy** group, led by **José Ignacio Pascual** (ji.pascual@nanogune.eu). More information can be found at <https://www.nanogune.eu/en/research/groups/quantum-probe-microscopy>

Atomically precise carbon-based nanostructures synthesized on surfaces have emerged as a powerful platform to investigate correlated quantum phenomena in low-dimensional systems. In particular, open-shell graphene nanostructures host localized spin states, whose interactions can give rise to magnetic excitations, collective quantum phases, and, when coupled to substrates, to novel hybrid states involving charge, spin, and light.

A central challenge in this field is to establish a direct link between atomic-scale structure, electronic configuration, and emergent magnetic and optical properties, and to understand how these properties can be engineered through molecular design and substrate coupling. The **objective** of this master project is to investigate the magnetic and optical response of atomically precise carbon nanostructures fabricated by on-surface synthesis, and to elucidate the microscopic mechanisms governing their excitations at the single-molecule level.

The **research strategy** relies on correlating structural, electronic, and optical observables on the same individual nanostructures with atomic precision, enabling a direct and quantitative understanding of their quantum behavior. In particular, the project will combine complementary **experimental techniques** within a unified atomic-scale framework:

- On-surface synthesis under ultra-high vacuum (UHV) to fabricate custom-designed carbon nanostructures with atomic precision
- Low-temperature scanning tunneling microscopy (STM) to access their electronic structure and local density of states
- Non-contact atomic force microscopy (AFM) for structural characterization with submolecular resolution
- Scanning tunneling spectroscopy (STS) to probe magnetic excitations and correlated electronic states
- STM-induced electroluminescence to investigate optical emission processes at the nanoscale

The **student** will acquire hands-on experience in advanced experimental nanoscience, including the operation of low-temperature UHV scanning probe microscopes (STM/AFM), surface preparation and on-surface synthesis, and spectroscopic techniques to probe electronic and spin excitations at the atomic scale. In parallel, the student will develop skills in data analysis and the interpretation of quantum phenomena in low-dimensional systems, complemented by exposure to theoretical and computational tools for modeling electronic structure and spin interactions. This interdisciplinary training will strengthen the student's ability to design experiments, critically analyze results, and communicate scientific findings within an international research environment.

We promote teamwork in a diverse and inclusive environment and welcome all kinds of applicants regardless of age, disability, gender, nationality, race, religion, or sexual orientation.

Candidates should **apply** by following the instructions and recommendations of the general call and by completing the **form below** and attaching the following documents:

- a. A complete CV
- b. Academic record and cover letter grouped in a single PDF file

The **deadline** for applications is **06/04/2026**.

NOTES:

(i) All applicants will receive an answer after the end of the selection process; but please note that due to the large number of submissions that are expected, we cannot provide individual feedback.

(ii) Additional information about nanoGUNE's commitment towards [HR excellence in Research and Gender Equality](#) are available on our website.

(iii) We encourage you to subscribe to our [HR mailing list](#) to receive information related to nanoGUNE's open positions and open calls for different training and talent attraction programs.