

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

OPTICAL GENERATION OF COHERENT VIBRATIONAL STATES IN A MOLECULAR ENSEMBLE: EXPLORING NON-LINEAR OPTICS WITH QUANTUM STATES

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 student will incorporate a group working on cutting-edge developments of near-field optics. One of its recent milestones is the optical control of molecular vibrational states confined in nanostructures. Leveraging on this result, the student will study via an analytical model and numerical calculations the opportunity to optimize this control and create what is called in quantum optics a coherent state. The generation of quantum states of matter is of broad interest for many scientific communities nowadays. During this ambitious project, the student will have the opportunity to study how these states would impact nonlinear optics signals and how they could be advantageous for characterization of materials at the nanoscale.

This **project** will be articulated around the following tasks:

- 1) Optimization of cascaded nanostructure for large coherent excitation of vibration
- 2) Quantum description of the generated state for the single molecule and ensemble cases
- 3) Study of the coherent state impact on accessible nonlinear optics signals

The position is offered in the **Nanooptics Group**, led by **Rainer Hillenbrand** (r.hillenbrand@nanogune.eu). More information can be found at <https://www.nanogune.eu/en/research>.

The position is expected to start in **01/09/2025** and for a total length of **up to 10 months** (01/09/2025 - 30/06/2026).

Candidates should apply 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 **22/06/2025**.

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.

