

Carbon nanoribbons are nanometrically narrow stripes of graphene, which display an interesting variety of electronic properties, including tunable conduction and topologically protected states, which can be exploited in quantum technologies in different ways. In collaboration with the experimental group of Nanoimaging in Nanogune, different ribbons, including atomic scale modifications and on a various substrates, will be studied using quantum- mechanical first-principles simulations.

#### Details of the project:

Using theory and first-principles calculations, the project aims to characterize electronic states of nanoribbons of controlled characteristics realized in experiments, which should display topologically protected states, and help analyzing the experimental results themselves by comparing with their simulated counterparts.

#### Description of the research group:

The **Theory group** of Nanogune has ample experience in the description of condensed matter from first-principles simulations, in general, and with a long history of work in nanostructures, surfaces and graphene. For more information, see our website at <https://www.nanogune.eu/en/research/groups/theory>

#### Tasks:

Establish and perform a series of large-scale first-principles calculations for various graphene nanoribbon realizations, on well controlled substrates. Analyse the quantum mechanical states close to the Fermi level.

#### Objectives:

Understand the behaviours obtained in experiments, steer following experiments, and make progress in the engineering of the ribbons for quantum device applications.

#### Work materials:

The work is theoretical and computational, and will involve the use of supercomputers using parallel computing. The programs will be provided.

#### Application:

If you are a master student and you are interested in this project, please get in touch with the scientist in charge: **Emilio Artacho** ([e.artacho@nanogune.eu](mailto:e.artacho@nanogune.eu)).

To apply for a **master position** fill in the form below and follow the instructions and recommendations of the general call (**open until 31 July 2023**).

*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.*