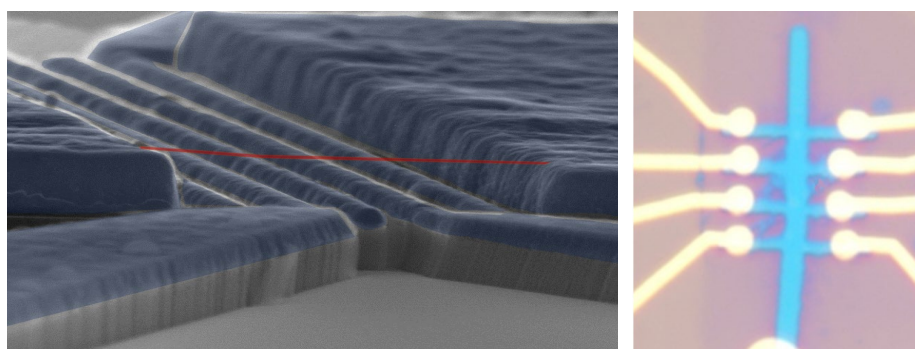


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## Positions at Master, PhD, and Postdoctoral level available in quantum electromechanics and quantum matter physics

The Quantum NanoElectronics and NanoMechanics research group at ICFO, led by Adrian Bachtold, is looking for well-qualified, highly motivated and dynamic PhD students and postdocs who wish to enhance their scientific career in a friendly, international and stimulating environment within the field of condensed matter.



One project focuses on the first demonstration of a mechanical qubit. For this, we will operate a nanotube mechanical resonator hosting a double-quantum dot in a regime where the electromechanical coupling induces a strong nonlinearity in the mechanical vibrations (left Figure). We will carry out quantum information processing experiments with the information stored in the mechanical vibrations. We target qubits with sub-kHz decoherence rate. Mechanical qubits may offer new perspectives for quantum computing and quantum sensing.

We also propose to realize, for the first time, a quantum simulator of strongly correlated electron-phonon-based systems. To achieve this, we will use nanotubes (i) with an array of four quantum dots and (ii) where the phonon modes – the mechanical modes – are delocalized over the suspended nanotube region. Our aim is to explore the rich interplay between the electron-electron repulsion and the electron-phonon interaction with a highly tunable system, which is something not possible using bulk materials.

Another project consists in exploring orbital magnetism, topological insulators, and unconventional superconductivity in magic angle twisted bilayer graphene. This is a novel system where two sheets of graphene are twisted relative to each other by an angle of about 1 degree. We will use innovative approaches to explore the different states of twisted bilayer graphene.

Candidates should email a CV to [adrian.bachtold@icfo.eu](mailto:adrian.bachtold@icfo.eu)