

The mission of the Catalan Institute of Nanoscience and Nanotechnology (ICN2) is to achieve the highest level of scientific and technological excellence in Nanoscience and Nanotechnology. Its research lines focus on the newly-discovered physical and chemical properties that arise from the behavior of matter at the nanoscale. ICN2 has been awarded with the Severo Ochoa Center of Excellence distinction for two consecutive periods (2014-2018 and 2018-2022). ICN2 comprises 19 Research Groups, 7 Technical Development and Support Units and Facilities, and 2 Research Platforms, covering different areas of nanoscience and nanotechnology.

### **Job Title: Post-doctoral position in the group EPHONI**

### **Research area or group: Phononic and Photonic Nanostructure**

#### **Description of Group/Project:**

Topological insulation, originally observed in Quantum Mechanics, has been recently transposed into classical physics, opening up new avenues in unprecedented wave control possibilities, namely in photonic and phononic crystals. Remarkable one-way propagating edge states were observed in nontrivial bandgaps when systems with topologically different phases were coupled. A fascinating property of these edge states is their high robustness to various types of disorders and imperfections leading to wave steering in absence of backscattering.

The objective of this post-doc position is to develop a dual phononic and photonic (phoXonic) topologic insulator for optomechanical applications on a single Si-based platform. This approach is expected to allow (i) to generate MHz and GHz mechanical waves optically, and (ii) to transport the acoustic and optical information through a single topological waveguide.

The theory group (ephoni), involved in the project, is led by Prof. Y. Pennec and has a long experience on the theoretical study of wave propagation in phononic, photonic, and plasmonic nanostructures/crystals. The main activities concern defects in phononic crystals, slab and surface modes, acoustic metamaterials, and locally resonant structures. Great effort has been devoted during the last few years to the topic of “phoxonic crystals and cavity optomechanic interactions” in the frame of H2020-FET Open TAILPHOX and PHENOMEN. The “Institut d’Electronique, Microélectronique et Nanotechnologie” (<http://www.iemn.fr>) is located at the University of Lille, France (<http://www.univ-lille.fr>). With a total staff of over 500 persons, the institute has a broad area of research activity ranging from the physics of materials and nanosciences to nanotechnology and instrumentation with five major interconnected topics: Materials and nanostructures, Microtechnology and Microsystems, Micro-nano and opto-electronics, Telecommunications, Acoustics.

#### **Main Tasks and responsibilities:**

The objective of this post-doc position is to develop a dual phononic and photonic (phoXonic) topologic insulator for optomechanical applications on a single Si-based platform.

This approach is expected to allow to:

- generate MHz and GHz mechanical waves optically
- transport the acoustic and optical information through a single topological waveguide.

The candidate will join the ERC project LEIT (“Lossless information for emerging information technologies”) coordinated by Prof. C. Sotomayor Torres. The candidate will be co-supervised by Dr. Marco Miniaci and Prof. Yan Pennec.

He/she will work on the modeling and simulation of phononic, photonic and optomechanical properties in collaboration with groups specialized in the fabrication and material characterization.

The candidate is also expected to contribute on the analysis and interpretation of data, manuscript preparation and dissemination of the results in the context of national and international conferences/meetings.

The theoretical work will be conducted in close relation with the fabrication and characterization of relevant samples at ICN2 (Spain).

#### Requeriments:

- **Education**

PhD in physics or in electrical/telecommunication engineering

- **Knowledge and professional experience**

Advanced experience in simulation methods (FEM, FDTD, ...) in periodic and composite structures.

A solid background in phononic/photonic crystals and wave propagation in periodic media

#### Summary of conditions:

- Full time work (37,5h/week)
- Contract Length: Temporary (1year renewable)
- Salary will depend on qualifications and demonstrated experience.
- Support to the relocation issues.
- Life Insurance.

Estimated Incorporation date: as soon as possible

#### How to apply:

All applications must be made via the ICN2 website <https://jobs.icn2.cat/job-openings/348/post-doctoral-position-in-the-group-ephoni> and include the following:

1. A cover letter.
2. A full CV including contact details (list of publications)
3. 2 Reference letters or referee contacts.

“This position has received funding from the European Research Council (ERC) under the European Union’s Horizon 2020 research and innovation programme (Lossless information for Emerging Information Technologies (LEIT)-grant agreement No 885689)” and the EU emblem and the ERC logo”



#### Equal opportunities:

ICN2 is an equal opportunity employer committed to diversity and inclusion of people with disabilities.