Topological phoXonic crystals

Post-doctoral position in the group EPHONI
Institute of Electronic, Microelectronic and Nanotechnology (UMR CNRS 8520), University of Lille, France

Project Description: 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 propose and develop numerically 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.

Main tasks and responsibilities: 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).

Required qualifications: Candidates are required to hold a PhD in physics or in electrical/telecommunication engineering with 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 is also required. Applicants are asked to provide the following documents: motivation letter (1 page), short CV, a list of publications and reference letters to Prof. Yan Pennec (yan.pennec@univ-lille.fr) and Dr. Marco Miniaci (marco.miniaci@univ-lille.fr).

To apply: https://bit.ly/3xYbOIE
End of application: January, 31, 2022
Starting date: April 1st, 2022, negotiable
Duration: 1-year renewable

Additional information on the group: 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.

Location: 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.

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