Topological modes in 1D PhoXonic crystals for Optomechanical applications

Yan Pennec*[1]

[1]Université de Lile – IEMN UMR 8520, CNRS, Univ. Lille, Centrale Lille, UVHC, ISEN – France

Abstract

Nano-Opto-Electro-Mechanical Systems (NOEMS) are devices in which electrons, photons, and phonons can coexist and interact in the nanoscale. With proper engineering, NOEMS can achieve essential functionalities in information and communication technology (ICT) systems. Our interest is focused on a class of periodic structures, called phoXonic crystals, which aim to simultaneously localize photons and phonons in the same submicronic periodic structures. Such confinement can lead to a strong enhancement of the phonon-photon interaction, allowing, for example, the modulation of light propagating in waveguides or cavities by acoustic vibrations. Recently, topological insulating properties systems have emerged as one of the important mechanisms for the control of electromagnetic/elastic waves due to their unique properties like unidirectionality, robustness, backscattering-free propagation in the presence of structural defects/disorders. Here we explore topological properties, using the Su-Schrieffer-Heeger (SSH) in the simultaneous localization of photon and phonon at the topological interface. Different cavities will be explored, from conventional to SSH, together with random distribution. These concepts open the way to new information technology based on the manipulation of phonons and their coupling with photons and RF electronics. *This work is supported by the Horizon Europe program under MAGNIFIC, MUSICIAN and* the ERC *LEIT projects.*

*Speaker