Abstract

Cavity optomechanics is a vast, solid research field with exciting and intriguing problems yet to be solved, especially concerning the forthcoming quantum technologies. With intense experimental activity ranging from fundamental to highly applicable sciences, it found a perfect match with micro- and nano-structured devices, which conveniently favour strong light-matter interaction with their small optical mode volumes and low-mass mechanical resonators. Combining state-of-the-art photonics with the design evolution of suspended structures in multiple material platforms brought optomechanics to the quantum level. It amazingly opened a window to observing quantum phenomena at microscopic objects, also unleashing a tool for quantum communication sciences, readily compatible with low-loss optical information transfer and with versatile and robust mechanical transduction able to interface hybrid systems hosting quantum emitters. In this talk, I will present the basic foundations of optomechanics and discuss the experimental challenges toward achieving quantum devices based on cavity optomechanics.