Towards quantum electromechanical states in a nanotube

Adrian Bachtold
ICFO – The Institute of Photonic Sciences, Barcelona, Spain
adrian.bachtold@icfo.es

Mechanical resonators based on carbon nanotubes feature a series of truly exceptional properties. In particular, the mechanical vibrations are highly sensitive to the tiny forces associated with the electron states in the nanotube and vice versa, leading to large backaction effects. In this talk, I will present results where we strongly couple mechanical vibrations to the two electron states involved in single-electron tunnelling (SET). It renormalizes the resonance frequency by a large amount, up to 25 % of its value. This results in a highly nonlinear potential for mechanical vibrations despite the relatively low quanta population (about 80 quanta). I will finish by explaining our effort towards the realization of a mechanical qubit.