Cavity Optomechanics

Prof. Eyal Buks

Department of Electrical Engineering, Technion

The field of cavity optomechanics deals with a family of systems, each is composed of two coupled elements. The first one is a mechanical resonator, commonly having low damping rate, and the second one is an ancilla system, which is typically externally driven. Commonly, the mutual coupling between the subsystems (mechanical resonator and the ancilla system)makes the dynamics of the ancilla system dependent on the displacement of the mechanical resonator. Such coupling can be exploited for displacement detection of the mechanical resonator, which can be performed by monitoring the response of the driven ancilla system. On the other hand, the same coupling unavoidably gives rise to back-reaction effects acting back on the mechanical resonator and effectively modifying its properties and its dynamics. The talk will be devoted to three experiments. In the first one, the ancilla system is an optical cavity formed using an optical fiber; in the second one the ancilla system is a microstrip superconducting microwave cavity; whereas in the third experiment a direct current (DC) superconducting quantum interference device (SQUID) plays the role of the ancilla system. A variety of back-reaction effects are observed in these experiments including linear and nonlinear spring effect, dynamical meta-stability and self-excited oscillations.