Studies on optomechanics and nanomechanics.

Objective

To obtain new insights in the growing fields of optomechanics and nanomechanics

Summary of Research Activities

- There is growing interest in opto-mechanics and nanomechanics. Our results provide new insights into the following problems: quantum back-action in nano-electro-mechanical systems, opto-mechanically-induced transparency in parity-time-symmetric micro-resonators, circuit analog of quadratic opto-mechanics, squeezed optomechanics with phase-matched amplification and dissipation, steady-state mechanical squeezing in an optomechanical system via Duffing non-linearity, enhancement of mechanical effects of single photons in modulated two-mode optomechanics, coherent manipulation of a Majorana qubit by a mechanical resonator, giant nonlinearity via breaking parity-time symmetry for low-threshold phonon diodes, noise suppression of on-chip mechanical resonators by chaotic coherent feedback, tunable multi-phonon blockade in coupled nano-mechanical resonators.

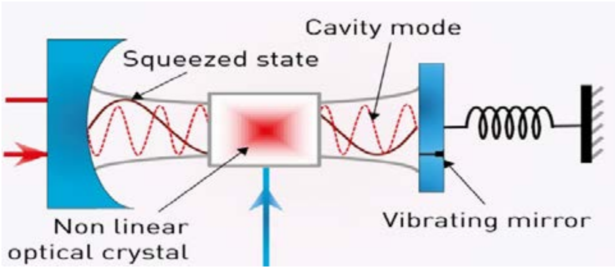

Fig. 1: A vibrating mirror interacts with light inside a mirror-confined cavity. Adding a nonlinear optical crystal to the cavity creates a squeezed state of light that is coupled to the cavity modes and induces strong optomechanical coupling with the vibrating mirror with single-photon control.

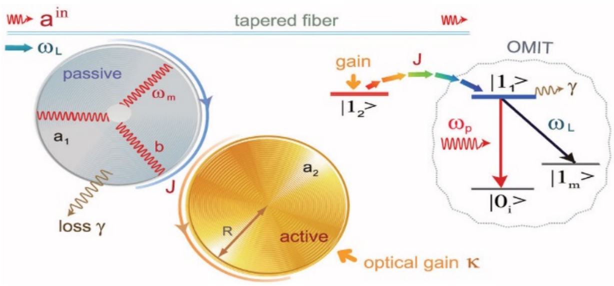

Fig.2 Optomechanically-Induced Transparency in parity-time-symmetric microresonators.

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