Harnessing photon-phonon coupling in integrated optical circuits

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Abstract: We present the state-of-the-art of stimulated Brillouin scattering in integrated optical circuits, with a particular focus on recent observations in silicon waveguides. In addition, we report on a spatiotemporal symmetry between Brillouin-active waveguides and optomechanical cavities.

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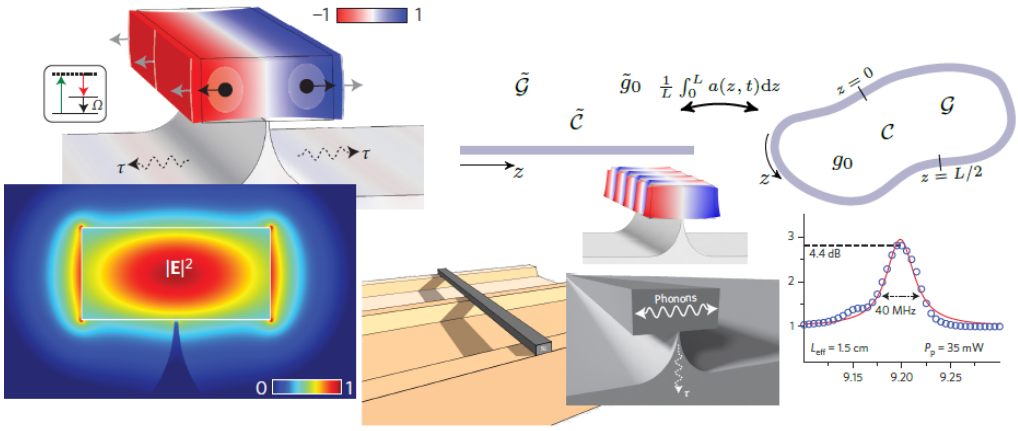
The century-old study of photon-phonon coupling has seen a remarkable renaissance in the last decade. Driven by early observations of dynamical back-action, the field of cavity optomechanics[1] progressed to ground-state cooling of mesoscopic mechanical oscillators, electromagnetically induced transparency and the counting of individual phonons[2]. From another angle, recent work aims to merge phononic technologies into integrated circuits – with notable observations of Brillouin scattering in chalcogenide[3] and silicon photonic waveguides[4,5]. In this talk, we will highlight the potential of silicon phononics – at the same time exploring the symmetries[6] of photon-phonon interaction in systems ranging from silicon nanowires to plasmonic Raman cavities, optomechanical crystals and cold-atom clouds.



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