Speaker: Florian Marquardt
Session: Quantum optomechanics 1
See program for placement.

Topological Phases of Sound and Light

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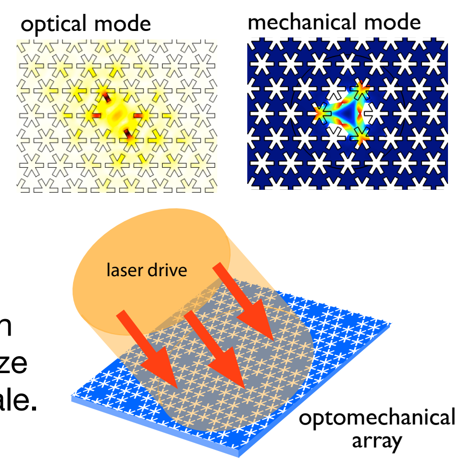
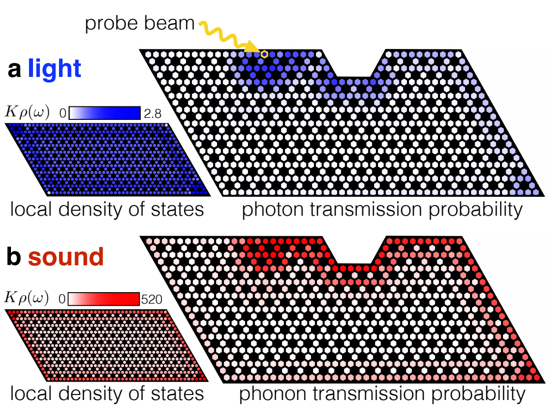


Sound (mechanical vibrations) and light interact via radiation forces, such as radiation pressure. In cavity optomechanics, researchers study how this can be applied to nano- or micromechanical resonators coupled to an optical cavity or any other localized optical mode.

Since a few years, optomechanical systems based on photonic crystals have been explored experimentally, with superior parameters. A single defect site is used to localize both a vibrational and an optical mode on the micron-scale. We envisage future "optomechanical arrays" built by extending this to a periodic array of such defect modes. Photons and phonons can tunnel between different sites in this array. Their effective interaction can be modulated by the drive laser frequency, intensity, and phase.



In this talk, I will describe how one can implement synthetic magnetic fields for both photons and phonons in such optomechanical arrays. Furthermore, I will show how a Chern insulator for phonons could be implemented in such a setting. This would be the first example of a Chern insulator band structure with topologically protected edge states for phonons in the solid state.

References

Optomechanical Metamaterials: Dirac polaritons, Gauge fields, and Instabilities, Michael Schmidt, Vittorio Peano and Florian Marquardt, arXiv:1311.7095 (2013)

Topological Phases of Sound and Light, Vittorio Peano, Christian Brendel, Michael Schmidt, and Florian Marquardt, arXiv:1409.5375 (2014)