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Tailoring the flow of light and sound in an optomechanical array
MICHAEL SCHMIDT, VITTORIO PEANO, FLORIAN MARQUARDT, University of Erlangen-Nuernberg — Recent progress in the field of optomechanics may soon allow the realization of optomechanical arrays, i.e. periodic arrangements of optical and vibrational modes whose interaction can be tuned in-situ by a laser. The most promising implementation is based on a simple setting, a dielectric slab with a suitable pattern of holes. The flow of light and sound in such a device could be tailored by engineering the laser wavefront, e. g. creating effective potential landscapes, tuning the phonon hopping range, or creating artificial gauge fields. We show that photons and phonons on a honeycomb lattice will produce an optically tunable Dirac-type band structure. Transport in such a system can exhibit transmission through an optically created barrier, similar to Klein tunneling, but with interconversion between light and sound.

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