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Topological Transport of Light and Sound CHRISTIAN BRENDEL, VITTORIO PEANO, MICHAEL SCHMIDT, FLORIAN MARQUARDT, FAU Erlangen-Nuremberg — Since they exploit global features of a materials band structure, topological states of matter are particularly robust. Having already been observed for electrons, atoms, and photons, it is an outstanding challenge to create a Chern insulator of sound waves in the solid state. In this work, we propose an implementation based on cavity optomechanics in a photonic crystal. We demonstrate the feasibility of our proposal by means of an effective lattice model as well as first principle simulations. The topological properties of the sound waves can be wholly tuned in situ by adjusting the amplitude and frequency of a driving laser that controls the optomechanical interaction between light and sound. The resulting chiral, topologically protected phonon transport can be probed completely optically.

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