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Interacting Su-Schrieffer-Heeger Chains Modeled in Optical Waveguides: Doublons, Edge States, and Transitions between them HELENA DRUEEKE, DIETER BAUER, University of Rostock, Germany — Su-Schrieffer-Heeger (SSH) chains are finite, one-dimensional, periodic structures, and one of the simplest models for topological phase transitions. Often, they are realized experimentally by placing particles in magneto-optical traps. Instead, we consider experiments that implement the sites of the chain as optical waveguides and the particles as light coupled into them.

The behavior of two particles in one dimension is mathematically equivalent to that of a single particle in two dimensions. Therefore, in the waveguides, the light in a two-dimensional array of fibers models the behavior of two particles on a linear chain. The interaction between the particles can be tuned by modifying the refractive indices at certain sites in the two-dimensional pattern.

While the SSH model itself has a topological phase with edge states and a trivial phase without them, the interaction between two particles can cause doublon states. In those doublon states, the particles are at the same lattice site, even though their interaction is repulsive. We will present our tight-binding calculations of these states and the transitions between them. In the experiment, this corresponds to light switching between fibers in a bundle of waveguides.

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