Experimental Realization of Bloch Oscillations in a Parity-Time Synthetic Silicon Photonic Lattice

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As an important electron transportation phenomenon, Bloch oscillations have been extensively studied in condensed matters. Due to the similarity with the wave properties between electrons and other quantum particles, Bloch oscillations have been observed in acoustic systems, photonic lattices, etc. One of the many distinct advantages for choosing these systems over the regular electronic systems to study Bloch oscillations and transport phenomena is the versatility in engineering artificial potentials. Here by utilizing dissipative elements in a CMOS compatible photonic platform to create a periodic complex potential and by exploiting the emerging concept of parity-time synthetic photonics, we experimentally realize for the first time spatial Bloch oscillations in a non-Hermitian photonic system and show that such system gives rise to new physical concepts, which may have significant impact in the field of quantum simulation.

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