

Abstract Submitted
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Symmetry-protected zero-mode laser with a tunable spatial profile¹ LI GE, College of Staten Island/Graduate Center, CUNY — Majorana zero modes in condense matter systems have attracted considerable interest in topological quantum computation. In contrast, while robust zero modes have been observed in various photonic lattices, it remains an open question whether they can be used for the same purpose. To advance significantly the state-of-the-art in zero-mode photonics, new inspirations are needed for a better design and control of photonic systems. Using the zero modes protected by non-Hermitian particle-hole symmetry in a photonic lattice and the spatial degrees of freedom they offer, we propose a single-mode, fixed-frequency, and spatially tunable zero-mode laser. The system does not need to have zero modes before a localized pump is applied; they are created by the spontaneous restoration of particle-hole symmetry. By modifying this process using different pump configurations, we present a versatile way to tune the spatial profile of our zero-mode laser, with its lasing frequency pinned at the zero energy. Such a zero-mode laser may find applications in telecommunication, where spatial encoding is held by some to be last frontier of signal processing.

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