**Impact of nonlinearity on the zero-mode lasing in optical lattices**

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Photonics has provided a variety of flexible and controllable systems for probing topological phenomena. Recently, the first experimental realization of a Majorana zero-mode bound at vortex-like distortion has been demonstrated in [1]. The result of the distortion is the creation of a robust mode localized in the vicinity of the vortex core.

Here, we focus on finite bipartite armchair hexagonal-shaped lattice with a vortex-like (“Kekule”) distortion [2] and study novel aspects of the zero-mode dynamics in the presence of the nonlinear lattice response and nonlinear driving [3]. We first investigate the impact of saturable Kerr nonlinearity on the properties of zero-modes [4]. The extreme robustness of zero-modes to external perturbation indicate that managing the driving parameters, saturable gain [5] and linear loss, can lead to an efficient and steady lasing regime. We examine how the nonlinearity affects the lasing efficiency, since these effects are unavoidable at higher powers. Based on the results, we propose a new topological laser realisable in a multicore optical fibre.

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