Abstract Submitted
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One-dimensional topological chains in two-dimensional non-topological optical lattices[1] LEI JIANG, CHUANWEI ZHANG, University of Texas at Dallas — Majorana fermions appear near the topological phase boundary. In 2D, Majorana fermions are found when vortices, which stand for topological defects, are formed in topological superfluids. Due to the complications to generate 2D topological superfluids in experiments, Majorana fermions are not easily achievable in 2D systems. In our work, we show, by imprinting 1D local potentials in a finite 2D system, we can realize a 1D topological chain on demand even in originally non-topological 2D systems. A pair of zero-energy Majorana fermions can be stable in this system and exist at the ends of the topological chain. We also demonstrate the possibility to arrange an array of Majorana fermions by separating topological chains with non-topological ones. Similar results can be obtained in 3D optical lattices. Compared with strictly 1D systems, quantum fluctuations are strongly suppressed in such high dimensional optical lattices. Because all requirements of our model are within the reach of current experiments, our proposed scheme may provide an experimental feasible platform for observing Majorana states in 2D ultra-cold atom optical lattices.

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