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On demand generation of 1D topological chains with Majorana fermions in 2D non-topological optical lattices[1] LEI JIANG, CHUANWEI ZHANG, Department of Physics, The University of Texas at Dallas — Majorana fermion appears near the topological phase boundary. In 2D, Majorana fermions are proposed when vortices, which stand for topological defects, are formed in topological superfluids only with Rashba spin-orbit coupling. Majorana fermions are not easily achievable in 2D cold atom 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 exists 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. 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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