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Protocols for dynamically probing topological edge states and dimerization with fermionic atoms in optical potentials MEKENA METCALF, CHEN-YEN LAI, University of California, Merced, KEVIN WRIGHT, Dartmouth College, CHIH-CHUN CHIEN, University of California, Merced — Topological states and phases have been observed in ultra-cold atomic systems. However, imposing a confining harmonic potential distorts the energy spectrum and prevents the detection of topological boundary states. We propose realistic setups for generating one-dimensional topological systems with well-defined boundary and protocols to resolve the detection of edge-states arising in a dimerized lattice using ultra-cold fermions. Atoms confined in a dimerized ring lattice, whose boundary conditions are transformed from periodic to open using an off resonant laser sheet, generate topological boundary states. A particle injected onto the edge site of a dimerized structure in a topological configuration can sustain a finite density as the system evolves in time. Alternatively, depleting an initially filled lattice away from the boundary reveals prominent occupied edge states. Signatures of dimerization in the presence of onsite interactions can be found using certain correlations as the boundary condition dynamically transforms from periodic to open. These correlations reveal a memory effect of the initial state which can distinguish dimerized structures or different insulating phases.

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