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Minimum Instances of Topological Matter in an Optical Plaquette[1]

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We propose experimental schemes to create and probe minimum forms of different topologically ordered states in a plaquette of an optical lattice: Resonating Valence Bond, Laughlin and String condensed states. We show how to create anyonic excitations on top of these liquids and detect their fractional statistics. In addition, we propose a way to design a plaquette ring-exchange interaction, the building block Hamiltonian of a lattice topological theory. Our preparation and detection schemes combine different techniques already demonstrated in experiments with atoms in optical superlattices.

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