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Topological insulators of interacting bosons in two dimensions: Classification, effective field theory and microscopic construction YUAN-MING LU, ASHVIN VISHWANATH, University of California, Berkeley — While topological insulators of non-interacting fermions have been extensively studied, we know very little about topological insulators of bosons, whose realization necessitates strong interaction. In this work we apply Chern-Simons effective theory to classify and characterize interacting bosonic topological insulators in two spatial dimensions. These topological phases have a unique ground state on any closed manifold and no fractional excitations: yet they feature gapless edge states which are often protected by a symmetry. Examples include a bosonic analog of chiral superconductors, bosonic integer quantum Hall states (with Hall conductance quantized to even integers) and bosonic analog of the quantum spin Hall state. We show that these topological phases can be constructed in various ways: such as in arrays of coupled one-dimensional quantum wires. Our formulation also naturally applies to topological insulators of two-dimensional interacting fermions.

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