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Topological order in correlated topological insulators JOSEPH MACIEJKO, Princeton University, ANDREAS RÜEGG, Swiss Federal Institute of Technology Zurich, VICTOR CHUA, University of Illinois at Urbana-Champaign, GREGORY A. FIETE, University of Texas at Austin — Motivated by recent experiments on correlated transition-metal oxides, an important outstanding issue in the field of topological insulators is to understand the effect of electron-electron interactions beyond the relatively well-understood perturbative limit. Using the Z_2 slave-spin theory, we theoretically predict that interaction effects in a spinful Chern insulator (CI) can give rise to a novel strongly correlated topological state of matter, the CI*, which is distinct from both the weakly correlated CI and the recently studied fractional CI. In the CI* the Hall conductivity and the quasiparticle charge are integer, but the quasiparticle statistics are fractional (semionic). In a time-reversal invariant 3D topological insulator strong interactions can give rise to a novel strongly correlated topological state of matter, the TI*, that is distinct from both the weakly correlated TI and other recently proposed fractionalized phases such as the topological Mott insulator and the fractional TI. In the TI* the weak-field magnetoelectric response is quantized as in a weakly correlated TI, but the state is a symmetry-enriched topological phase, with eight degenerate ground states on the 3-torus and emergent particle and string-like excitations with nontrivial mutual statistics.

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