

The classification of non-interacting topological phases with space group symmetries is indispensable to our understanding of quantum materials. Drawing on a rephrasing of this classification in terms of local invariants (Noether charges), we generalize this classification to interacting 2D phases. We define Real Space Invariants (RSIs) as the quantum numbers of a set of symmetry operators on open boundaries — but which are independent of the choice of boundary — and use these indices to define and exemplify many-body fragile topology. As an application of these results, we identify which single-particle fragile states remain topological under interactions and which are many-body trivial, providing an exactly solvable model for the latter. We show that the many-body local RSIs appear as quantized coefficients of Wen-Zee terms in the topological quantum field theory describing the phase.