Beyond-Hermitian Quantum Physics

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Beyond-hermitian quantum physics has attracted a great deal of attention in many subfields of physics due to remarkable advances in experimental techniques and theoretical methods in AMO, condensed matter and nonequilibrium statistical physics [1]. A full knowledge of types and occurrence times of quantum jumps allows a complete description of quantum trajectories. A subclass thereof without quantum jumps can be described by a non-hermitian Hamiltonian. Here symmetries, topological properties and many-body effects of hermitian physics are fundamentally altered. Transposition and complex comjugation, which are equivalent in hermitian physics, become inequivalent in the non-hermitian framework, leading to nontrivial topological phases [2] through unification and ramification of topological phases [3] and resulting in 38 symmetry classes instead of 10 in the Altland-Zirnbauer classification [4]. In random matrices, transposition symmetry leads to two new universality classes of level-spacing statistics other than the Ginibre ensemble. In many-body physics, non-hermiticity leads to the dynamical sign reversal of magnetic correlations in dissipative Hubbard models [6] and anomalous g-theorem-violating reversion of renormalization-group flows in the Kondo problem [7].

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