Counterintuitive phenomena in atomic molecular and optical systems controlled by exceptional points

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Abstract

The need for non-Hermitian quantum mechanics (NHQM) to explain and compute observable phenomena will be discussed. In particular, I will explain the conditions for the formation of exceptional points (EPs), where two eigenstates of the Non-Hermitian Hamiltonian coalesce. This talk will demonstrate the impact of EPs in a wide range of surprising seemingly unrelated phenomena , including 1. Transitions from bound to metastable states in atomic, molecular, optical and mesoscopic systems, 2. Sharp features in electron-molecule scattering cross sections, 3. Phase transitions in electronic transmission through quantum dots, 4. Adiabatic and non-reciprocal atomic/molecular/optical mode switches; 5. Slow light generation , 5. Light absorption in atoms and molecules in the presence of external control fields and, most recently, 6. total suppression of electronic tunneling through double-barrier potentials in diodes.