

Controlling Chiral State Dynamics in Multiqubit and Multimode Non-Hermitian Systems

Ievgen Arkhipov

Palacky University, 17. listopadu 50A, Olomouc, Czech Republic

Non-Hermitian systems host exceptional points and other spectral singularities that give rise to novel topological and dynamical effects, including both asymmetric and symmetric state-switching regimes. However, the complex spectra of these systems often lead to instabilities and breakdown of adiabaticity, limiting the ability to reliably access the desired state-transfer mode. In this talk, we present strategies for effectively controlling both chiral and symmetric switching dynamics in such setups. Specifically, we show that by appropriately designing trajectories along which the evolution operator remains real, or by combining exceptional points with diabolic points in the system spectrum, one can mitigate, or even completely eliminate, nonadiabatic transitions, thus enabling robust and controllable state transfer in multi-qubit and/or multimode photonic systems. These findings open new avenues for topological quantum information processing and advanced wave-manipulation protocols in non-Hermitian platforms.