

Non-Hermitian Evolution from Continuous Monitoring

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In modern superconducting processors, it is possible to continuously monitor information about a quantum bit while it is evolving. A traveling microwave field briefly interacts with the qubit then is later measured, yielding a signal that is generally correlated with the qubit and thus partially collapses the qubit state. The resulting conditioned evolution of the reduced qubit state exhibits competition between unitary and collapse dynamics, so is fundamentally non-Hermitian and stochastic in character. Moreover, the specific character of the dynamics can often be resolved long after the qubit interacts with the traveling field, yielding a dynamical version of a delayed choice paradox. This talk clarifies how these conditioned dynamics correspond to a pre- and post-selected time-dependent Hamiltonian that involves complex weak values of observables interacting with the qubit. The complex and delayed-choice nature of the effective qubit Hamiltonian is determined by the boundary conditions connecting the prepared input field to the amplified and observed output signal.