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Witnessing coherence in the presence of decoherence through the Quantum Zeno effect

We address the problem of assessing the coherent character of physical evolution in the presence of decoherence. We take the quantum Zeno effect (QZE) as a characteristic trait of quantum dynamics, and derive relations between population transfer rates and the strength of the continuous measurement. These relations support the intuition that only quantum dynamics is susceptible to QZE, and allow us to reconstruct significant features of the unknown Hamiltonian, and provide lower bounds to its spectral spread, in a way which is robust to the presence of decoherence. Our results have potential application in assessing coherence of quantum transport in biological and other complex many-body systems.

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