

Masud Haque - Approaching the classical limit of Lindblad dynamics — emergence of limit cycles, fixed points and algebraic decay

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Iconic features of classical dissipative dynamics include persistent limit-cycle oscillations and critical slowing down at the onset of such oscillations, whereby the system relaxes purely algebraically in time. On the other hand, quantum systems subject to generic Markovian dissipation decohere exponentially in time, approaching a unique steady state. Here we show how coherent limit-cycle oscillations and algebraic decay can emerge in a quantum system governed by a Markovian master equation. We illustrate these mechanisms using a single-spin model motivated by Landau-Lifshitz-Gilbert dynamics, and using a bosonic model with dissipation.