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Quantum Interference between independent environments in open quantum systems CHING-KIT CHAN, GUIN-DAR LIN, ITAMP, Harvard University, SUSANNE YELIN, University of Connecticut, MIKHAIL LUKIN, Harvard University — When a general quantum system interacts with multiple environments, the environmental effects are usually treated in an additive manner in the master equation. This assumption becomes questionable for non-Markovian environments that have finite memory times. Here, we show that quantum interferences between independent environments exist and can qualitatively modify the dynamics of the reduced physical system. We illustrate this effect with examples of atomic systems coupled to structured reservoirs, and discuss its origin in general using a non-equilibrium diagrammatic technique. The consequential decoherence dynamics cannot be captured by an additive master equation.

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