

## Directly computing reduced density matrices with influence functionals

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The field theory of open quantum systems has ample applications in areas like particle or nuclear physics, cosmology and quantum gravity. Open quantum systems are commonly described by reduced density matrices, which are obtained by tracing out the environmental degrees of freedom, and whose evolution is given by quantum master equations. Solving such equations often poses an intricate or even analytically impossible task. As a way to circumvent such problems we will present a first principle-based and practicable formalism which allows for the direct computation of reduced density matrix elements without having to consider a master equation. It is based on techniques from non-equilibrium quantum field theory like thermo field dynamics, the Schwinger-Keldysh formalism and the Feynman-Vernon influence functional. As a simple example, we will discuss the open quantum dynamics of a real scalar field induced by an environment comprising another real scalar field.

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