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Quantum Information with Rydberg atoms: Role of dissipation and decoherence[1] DURGA BHAKTAVATSALA RAO DASARI, KLAUS MOLMER, Aarhus University — Originally inhomegeneities, decoherence and decay of the atomic systems were minimized in quantum computing proposals so that their effects would not disturb the ideal unitary evolution of the system. Recent works, however, suggest a quite opposite strategy, where inhomegeneities are created on purpose and and the system is driven on resonance with short lived states such that it dephases and decays to robust steady states. By suitable use of the interactions, these states can be selected, e.g., as entangled states or states encoding the outcome of a quantum computation. We investigate the coherent effects induced by dissipation and decoherence in neutral atom based quantum computing proposals, for creating robust entangled states and long distance gates. We also show that these incoherent effects can also be helpful for deterministic loading of optical traps with single atoms and to reliably store and emit single photons.

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