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A relaxed approach to quantum state engineering

In order to prepare and observe coherent and entangled superposition states, immense efforts are being devoted to eliminate relaxation and decoherence. Recent works, however, have pursued an exactly opposite approach and actively employed dissipation for quantum state engineering. Unlike unitary evolution, where controllability can be assessed and optimal solutions can be found in systematic ways, the combined use of dissipation mechanisms and interaction Hamiltonians currently offers a Zoo of different methodologies and working principles: coherent dark states, Zeno dynamics, heralding, cascaded systems, coherent feedback, ... . In this talk, I will review some recent ideas and methods for dissipative generation of useful quantum states and their possible implementation in atomic and quantum optical systems.