J Laser Opt Photonics 2018, Volume 5
DOI: 10.4172/2469-410X-C4-033

Shortcuts to adiabaticity in quantum optics and computing

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Shortcuts to adiabaticity (STA) are fast track paths towards the results of slow adiabatic processes, typically through non-adiabatic routes. STA are instrumental in fighting decoherence in two ways: one is passive, simply due to shortening the times; the other one is active, as the large freedom to choose the shortcut may be used in particular to optimize robustness versus decoherence and noise. Given the ubiquity of adiabatic process, STA are broadly applicable, in quantum systems and beyond, e.g., in optics or mechanical engineering. In this talk, the main approaches to STA and applications are reviewed, with emphasis on those relevant to quantum optics and quantum computation, such as manipulations of single qubits, trapped ions, logic gates, and three- or four-level systems.

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