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Continuous and Pulsed Quantum Control

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We show that the evolution of a quantum system can be controlled using two different procedures, one hinging upon a strong continuous coupling with an external control potential and the other consisting in the application of instantaneous unitary kicks to the system with high frequency, yielding a “bang-bang evolution”. In both cases the Hilbert space is partitioned in subspaces among which transitions are inhibited by dynamical superselection rules. Using the Trotter product formula the two procedures can be showed to be equivalent up to the order in which a double limit is evaluated. We have also showed that it is still possible to control the evolution of the system in an interpolating situation between the two kind of evolutions, thanks to the validity of a generalized product formula.

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