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Dynamics of a trapped particle in a time-dependent potential well

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Experimental and technological improvements have made it possible to modify a single-well potential into a double well and backwards [1]. To investigate such kind of problems, one needs to properly take into account the time-dependency of the system Hamiltonian. We used split operator method to study the dynamics of wavepacket while going from single to double well. Transformation of single well into double well is being controlled by a switch. We estimated the length of the switching time in order to leave the system in the ground state. We further simulated the system dynamics while going from single to asymmetric double well. We observed that the superposition of left and right states is very fragile with respect to asymmetry. We also estimated the switching time needed by a trapped ion to be in the ground state of a double-well potential, for realistic experimental parameters.

[1] G. Ciaramicoli, I. Marzoli, and P. Tombesi, Phys. Rev. A 82, 044302 (2010).

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