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Controlled entanglement of two atoms in movable traps HAIAN WANG, PENG ZHANG, MICHAEL CHAPMAN, LI YOU, Georgia Institute of Technology — We propose a scheme for controlled entanglement of two separately trapped atoms. In our setup, the two atoms become entangled after the two initially separated traps are translated towards each other, overlap, and moved apart adiabatically. Cumulative adiabatic phase shifts arising from atomic interactions during the protocol give rise to a final two-atom state that can be conveniently expressed in terms of separable states involving single atoms in well defined traps. We provide a thorough investigation of the efficiencies and effectiveness of our scheme. We further calibrate the dependence of the fidelities of the entangled states on the various control parameters such as the speed of the trap translation. Finally, we show that our setup possesses several advantages and can be easily employed to accomplish a nontrivial quantum gate.

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