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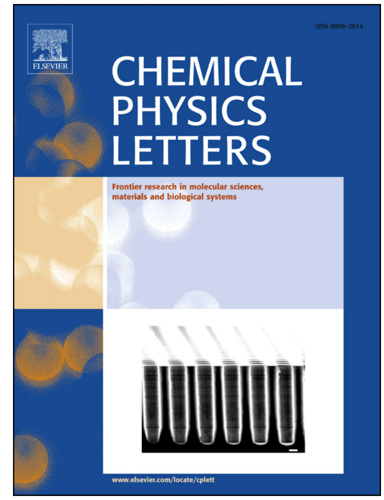

Quantum Controlled Fusion

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Quantum Controlled Fusion

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Abstract

Quantum-controlled motion of nuclei, starting from the nanometer-size ground state of a molecule, can potentially overcome some of the difficulties of thermonuclear fusion by compression of a fuel pellet or in a bulk plasma. Coherent laser control can manipulate nuclear motion precisely, achieving large phase space densities for the colliding nuclei. We combine quantum wavepacket propagation of D and T nuclei in a field-bound molecule with coherent control by a shaped laser pulse to demonstrate enhancement of nuclear collision rates. Atom-smashers powered by coherent control may become laboratory sources of particle bursts, and even assist muonic fusion.

Keywords: quantum control, boron hydride, tritium, deuterium, Feit-Fleck algorithm

Highlights:

- Conventional fusion experiments start with a very high entropy state
- Molecules provide lower entropy and more initial confinement
- As shown by wavepacket simulations, a coherent control field can enhance collision of nuclei in a field-bound molecule.

Graphical abstract: