

Tunneling Dynamics Between Any Two Multi-atomic-molecular Bose-Einstein Condensates

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Abstract: Tunneling dynamics of multi-atomic molecules between any two multi-atomic molecular Bose-Einstein condensates with Feshbach resonance is investigated. It is indicated that the tunneling in the two Bose-Einstein condensates depends not only on the inter-molecular nonlinear interactions and the initial number of molecule in these condensates, but also on the tunneling coupling between them. It is discovered that besides oscillating tunneling current between the multi-atomic molecular condensates, the nonlinear multi-atomic molecular tunneling dynamics sustains a self-locked population imbalance: a macroscopic quantum self-trapping effect. The influence of de-coherence caused by non-condensate molecule on the tunneling dynamics is studied. It is shown that de-coherence suppresses the multi-atomic molecular tunneling.

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Key words: tunneling dynamics, a molecular Bose-Einstein condensate, Feshbach resonance, de-coherence

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