

Название публикации:

Phase dynamics of discrete breathers periodically tunneling in weakly coupled nonlinear chains

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Аннотация:

We present a brief discussion of the phase-coherent dynamics of discrete breathers (intrinsic localized modes) in a system of two weakly coupled nonlinear chains and its comparison with periodic tunneling of quantum particles in a double-well potential and with macroscopic quantum tunneling of two weakly linked Bose-Einstein condensates. We consider the dynamics of relative phase of classically-tunneling discrete breathers in two weakly coupled nonlinear chains and show that the dynamics of the relative phase in the $\pi/2$ tunneling mode coincides with the experimentally observed dynamics of the relative phase of quantum particles, periodically tunneling in a double-well potential, both for noninteracting and strongly repulsively interacting particles. The observed coincidence demonstrates the correspondence between the dynamics of classical localized excitations in two weakly coupled nonlinear chains and tunneling dynamics of quantum object in the double-well potential. We show that in both $\pi/2$ and winding tunneling modes the relative phase experiences periodic jumps by π in the instants of complete depopulation of one of the weakly coupled chains or potential wells. The connection of the observed phase dynamics with the non-quantum uncertainty principle is discussed.

Ключевые слова:

Classical and quantum objects, Discrete breathers, Dynamics of relative phase, Non-quantum uncertainty principle, Periodic tunneling, Weakly coupled anharmonic chains, Winding tunneling mode, $\pi/2$ tunneling mode, Bose-Einstein condensation, Chains, Statistical mechanics, Winding, Anharmonic, Discrete breather, Quantum object, Relative phase, Tunneling modes, Uncertainty principles, Dynamics