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Stationary Classical Chaos of Trapped Two-Component Bose-Einstein Condensates in 1-D Optical Lattice Potentials

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Abstract: We study the nonlinear dynamics of two-component Bose-Einstein condensates in one-dimensional periodic optical lattice potentials. The stationary state perturbation solutions of the coupled two-component nonlinear Schrödinger/Gross-Pitaevskii equations are constructed by using the direct perturbation method. Theoretical analysis revels that the perturbation solution is the chaotic one, which indicates the existence of chaos and chaotic region in parameter space. The corresponding numerical calculation results agree well with the analytical results. By applying the chaotic perturbation solution, we demonstrate the atomic spatial population and the energy distribution of the system are chaotic generally.

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