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Competition between symmetry breaking and onset of collapse in weakly coupled atomic condensates

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We analyze the symmetry breaking of matter-wave solitons in a pair of cigar-shaped traps coupled by tunneling of atoms. The model is based on a system of linearly coupled nonpolynomial Schr\"odinger equations (NPSEs). Unlike the well-known spontaneous-symmetry-breaking (SSB) bifurcation in coupled cubic equations, in the present model the SSB competes with the onset of collapse in this system. Stability regions of symmetric and asymmetric solitons, as well as the collapse region, are identified in the parameter space of the system.

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