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Nonlinear dynamics from quantum mechanics for a BEC in a two-well potential JUHA JAVANAINEN, U. of Connecticut — We study theoretically a Bose-Einstein condensate in a double-well trap. With a sudden switch of the parameters the condensate is put in a state that would be an unstable equilibrium in the classical Gross-Pitaevskii equation description. Classically one would expect that the system recedes exponentially in time from the equilibrium, but such behavior is not possible under the unitary time evolution of quantum mechanics. We introduce a skeleton model for the detection of the numbers of condensate atoms in each potential well by light scattering. The strength of the measurement may be varied by varying the intensity of the probe light, thereby also adjusting the strength of the measurement back-action. We simulate individual runs of such an experiment using quantum trajectory methods. The distribution of the atoms between the two traps as inferred from the scattered light closely mimics the expected classical behavior provided the measurement is intrusive enough to resolve it, but not so strong that the back-action completely dominates the dynamics.

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