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BEC in a double-well trap: back-action from measurements of atom numbers forces classical behavior JUHA JAVANAINEN, YI LI, University of Connecticut — We consider a double-well trap containing a BEC, assuming that the numbers of the atoms on both sides of the trap are monitored continuously using light scattering. A master equation giving the exact quantum evolution is solved by means of quantum trajectory simulations. In parallel, we develop a corresponding classical model, a variation of mean-field theory, by expanding the equation of motion of the Wigner function as a power series in the inverse of the atom number. In this formulation random diffusion of the relative phase of the condensates in the two wells represents the quantum mechanical back-action of the measurements of the atom numbers. In our numerical examples the quantum and classical descriptions give results so similar that in practice it would be impossible to tell them apart experimentally, even under circumstances when mean-field theory is expected to fail.

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