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Kinetic Phase Transition in a Periodically Perturbed Magneto-Optically Trapped Atoms Far From Equilibrium GEOL MOON, YONGHEE KIM, JI-HYOUN KIM, Department of Physics and Astronomy, Seoul National University, HEUNG-RYOUL NOH, Department of Physics, Chonnam National University, WONHO JHE, Department of Physics and Astronomy, Seoul National University — Over the past few decades, the behavior of far from equilibrium systems and role of the fluctuation in nonequilibrium systems have been brought to attention and a considerable number of studies have been conducted in physics, chemistry, and biology. We use the periodically perturbed magneto-optical trapped $^{8}5$Rb atoms to investigate a noise-induced transition in nonlinear dynamical system, especially kinetic phase transition (KPT) which is similar behavior to first-order phase transition in equilibrium systems. The system is described by Duffing oscillation, and it is well-known that the Duffing oscillator undergoes the hysteresis. Within the particular range in frequency of the external driving, there is the bi-stable region which the large and small vibration amplitude coexists. We measure the occupation probability of bi-stable states directly because our system consists of many atoms in contrast to many trials for the measurement for single particle system. A critical region is shown to arise in the vicinity of the KPT point, at which the populations of two stable states are equal, including an appearance of a supernarrow peak in the spectral density of the fluctuations.

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