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Study of universality and critical behavior in periodically driven interacting cold atomic system MYOUNG-SUN HEO, YONGHEE KIM, WONHO JHE, Seoul National University, HEUNG-RYOUL NOH, Chonnam National University — Strongly driven nonlinear oscillators show a variety of interesting phenomena such as period doubling, bifurcation, chaos. Since their resonant behaviors are very sensitive to external perturbation, they have now been widely adopted for the precise determination of physical quantities. The key concept to these researches is the development of bistable or period-2 states, which are, in most cases, energetically degenerate. If particles interact each other, however, this degeneracy of two attractors can be lifted up. For example, in the simple case of all-to-all attractive interaction, particles will be preferably directed into more populated attractors. Being incorporated with random fluctuation which tries to equilibrate population in each attractor, this lifting-up becomes dependent on the system size, or the total number of particles, as recently observed as spontaneous symmetry breaking in cold atomic system which inherently possesses the light-induced attractive interaction. In particular, this dependence seems to show a sort of critical behavior. Here we have elucidated the criticality existing in the strongly driven interacting many-particle system consisted up of cold atoms from static and dynamic perspectives.

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