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Study of size-dependent interaction in driven cold atomic system MYOUNG-SUN HEO, Seoul National Uniersity, YONGHEE KIM, Seoul National University, WONHO JHE, Seoul National Univeristy, HEUNG-RYOUL NOH, Chonnam National University — It is well known that there exist cooperative interactions between magneto-optically trapped cold atoms, which is considered as a barrier to highly correlated quantum gases. However under some conditions, this can serve for adjustable interactions between atoms. When atoms are driven periodically, their one-dimensional motions can make effective global attractive interaction leading to spontaneous symmetry breaking (SSB) of atomic population on two symmetric attractors generated by parametric resonance. Here we have experimentally elucidated the effect of interaction in terms of thermodynamic response of atoms to the variation of system size, or total number of atoms, and bias field. In the regime of static response to the variation of system size, we have found that this SSB lies in the same universality class as mean-field Ising phase transition. When the oscillating bias field is exerted, the hysteric response of the system changes drastically over the critical number of atoms.

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