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Spontaneous symmetry breaking in parametrically driven atomic trap and measurement of dynamic critical exponents WONHO JHE, MYOUNG-SUN HEO, YONGHEE KIM, KIWHAN KIM, Seoul National University, HEUNG-RYOUL NOH, Chonnam National University, SEOUL NATIONAL UNIVERSITY TEAM, CHONNAM NATIONAL UNIVERSITY COLLABORATION — While critical phenomena in equilibrium systems has been well established both in theory and in experiment, experimental studies in non-equilibrium or far-from-equilibrium systems still lack of quantitative investigation and remain as challenging subjects. Here we report on the use of laser cooled and trapped atoms can be a good candidate for such study since one can easily control its temperature and numbers. By parametrically modulating the magneto-optical trap potential we have observed several interesting phenomena such as dynamic double well, Hopf bifurcation and spontaneous symmetry-breaking (SSB). Particularly SSB is identified as the mean-field system exhibiting the Ising-like phase transition. We measured critical exponents relevant to this phase transition, with respect to the control parameter, the size of the system or the total number of atoms. We also have observed the occurrence of SSB as the temperature is changed by illuminating a resonant laser light.

Wonho Jhe
Seoul National University

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