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On the microscopic theoretical approach of Spontaneous Symmetry Breaking in parametrically driven Cold atomic system JUNHYUN LEE, YONGHEE KIM, MYOUNG-SUN HEO, WONHO JHE, Department of Physics and Astronomy, Seoul National University, MARK DYKMAN, Department of Physics and Astronomy, Michigan State University — Although Spontaneous Symmetry Breaking (SSB) of atom clouds in parametrically driven Magneto-Optical Trap (MOT) has been reported, the precise mechanism of SSB in atomic level is yet fully recognized. In this presentation, therefore, we explore the microscopic theory underlying the SSB phenomenon. Starting with the well-known process of change of variables followed by the method of averaging, we newly include the interaction force, which is of the form of a step function. Using this model, we investigate how the transition rate of an atom between the two attractors changes in the presence of a second fixed atom. We generalize this result by adding more atoms and allowing mutual transitions. Based on these observations we attempt to predict the critical number required for SSB. We also show that this result is well compatible with the acknowledged relation between transition rate and activation energy. Finally, the theoretical approach is compared with the experimental results.

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