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Nonlinear novel oscillation of polaritons in the optical microcavity YONGCHANG ZHANG, XIANGFA ZHOU, GUANGCAN GUO, XINGXIANG ZHOU, Key Laboratory of Quantum Information, University of Science and Technology of China, Hefei, Anhui 230026, P. R. China, HAN PU, Department of Physics and Astronomy, Rice University, Houston, TX 77005, USA, ZHENGWEI ZHOU, Key Laboratory of Quantum Information, University of Science and Technology of China, Hefei, Anhui 230026, P. R. China — As a kind of new state of matter, Bose-Einstein condensation (BEC) in a dilute gas of trapped atoms is able to exhibit quantum phenomena on macroscopic scales. Recently, BEC of microcavity polaritons had been experimentally demonstrated. As a kind of bosonic quasi-particle which generates from the strong light-matter coupling, the polariton can be manipulated by the external laser field, and it provides a platform to simulate strongly correlated many-body models in the photon-coupled microcavity array. In this talk we present a scheme for simulating the nonlinear tunneling between two bosonic condensations in the microcavity system. Due to the controllability of the polariton, the effective nonlinear tunneling between two condensates of polaritons can be easily induced by the external controlling fields. In our work, a kind of two modes polariton model is derived, in which nonlinear tunneling strength depends on the difference of the particles in such two kinds of modes. We investigate the mean-field behaviors for such kind of double-mode polariton model, and we find that it is analogous to the model of the pendulum with variable pendulum length. Furthermore, some novel oscillation modes are revealed.

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