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Multi-stability in an optomechanical system with two-component Bose-Einstein condensate[1] YING DONG, Department of Physics and Astronomy, and Rice Quantum Institute, Rice University, Houston, Texas 77251-1892, USA, JINWU YE, Department of Physics, The Pennsylvania State University, University Park, PA 16802, USA, HAN PU, Department of Physics and Astronomy, and Rice Quantum Institute, Rice University, Houston, Texas 77251-1892, USA — We investigate a system consisting of a two-component Bose-Einstein condensate interacting dispersively with a Fabry-Perot optical cavity where the two components of the condensate are resonantly coupled to each other by another classical field. The key feature of this system is that the atomic motional degrees of freedom and the internal pseudo-spin degrees of freedom are coupled to the cavity field simultaneously, hence an effective spin-orbital coupling within the condensate is induced by the cavity. The interplay among the atomic center-of-mass motion, the atomic collective spin and the cavity field leads to a strong nonlinearity, resulting in multi-stable behavior in both matter wave and light wave at the few-photon level.

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