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Optically generated vortex-antivortex superpositions in two-component Bose-Einstein condensate ANAL BHOWMIK, Department of Physics, Indian Institute of Technology Kharagpur, Kharagpur-721302, India, PRADIP KUMAR MONDAL, Department of Physics, Egra Sarada Shashi Bhusan College, Egra-721429, India, SONJOY MAJUMDER, Department of Physics, Indian Institute of Technology Kharagpur, Kharagpur-721302, India, BIMALENDU DEB, Department of Materials Science, Indian Association for the Cultivation of Science, Jadavpur, Kolkata 700032, India — Allen and co-workers first brought up the realization that vortex beam can carry well defined orbital angular momentum (OAM) associated with its helical phase front. Apart from OAM, light has Spin angular momentum (SAM) associated with its polarization. Transfer mechanism of OAM and SAM from optical vortex to atoms and molecules is well known. Here, we investigate the microscopic interaction of a Laguerre Gaussian (LG) beam with a trapped two-component Bose-Einstein condensate (BEC). We consider ^{87}Rb BEC in two hyperfine spin components and the wavelength of LG beam is comparable to the atomic de-Broglie wavelength. Competitions between intra- and inter-component interactions produce interesting structure in the ground state of BEC which is applied to calculate the Rabi frequency of two photon stimulated Raman transition. Our analysis shows that the profile of the Rabi frequencies over the inter-coupling strengths can infer the properties of the BEC components. We demonstrate coherence in vortex-antivortex in terms of inter-component interactions when both the components are subjected to appropriate Raman transitions.

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