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Quantum dynamics of Raman-coupled Bose-Einstein condensates with Laguerre-Gaussian beams[1] RINA KANAMOTO, Department of Physics, The University of Arizona, EWAN WRIGHT, PIERRE MEYSTRE, Department of Physics, College of Optical Sciences, The University of Arizona — We study the quantum dynamics of Bose-Einstein condensates driven by Laguerre-Gaussian light beams. Due to the helical structure of the laser field, the orbital angular momentum of the photon is transferred to the atoms, resulting in a condensate in a coherent superposition of two components with distinct center-of-mass angular momenta. The quantization of the matter-wave field is found to exhibit the collapse and revivals in the resulting interference pattern between two components. The period of the collapse and revivals depends on the U(1) symmetry of the matter wave and is directly observable as the off-axis motion of quantized vortices in the condensate density. We further analyze the steady-state population transfer that can be achieved when applying a time-dependent two-photon detuning.

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