

Joint CQSE and CASTS Seminar

2019
May. 10, Friday

TIME May. 10, 2019, 14:30 ~ 15:30
TITLE Light-induced azimuthal gauge potentials and spin-orbital-angular-momentum coupling in atomic Bose-Einstein condensates
SPEAKER Dr. Yu-Ju Lin
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PLACE Rm716, CCMS & New Physics Building, NTU

Abstract

We demonstrate coupling between the atomic spin and orbital-angular-momentum (OAM) of the atom's center-of-mass motion in a Bose-Einstein condensate (BEC), referred to as “spin-orbital-angular-momentum coupling”. This is achieved by using two co-propagating Raman-dressing beams to couple the atoms in the hyperfine spin $F=1$ manifold while transferring orbital-angular-momentum (OAM) to the atoms' center-of-mass. One of the Raman beam is a Laguerre-Gaussian (LG) beam carrying OAM of light. In this system, we create synthetic azimuthal gauge potentials which act as effective rotations. We exploit the azimuthal gauge potential to demonstrate the Hess-Fairbank effect, the analogue of Meissner effect in superconductors. Our demonstration serves as a paradigm to create topological excitations by tailoring atom-light interactions. Further, the gauge field in the stationary Hamiltonian opens a path to investigating rotation properties of atomic superfluids under thermal equilibrium.

