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Experimental studies of collective excitations of a BEC in light-induced gauge fields CHUAN-HSUN LI, ROBERT NIFFENEGGER, DAVID BLASING, ABRAHAM OLSON, YONG P. CHEN, Purdue University — We present our experimental studies of collective modes including spin dipole mode and scissors mode of a ^{87}Rb Bose-Einstein condensate (BEC) in the presence of Raman light-induced gauge fields and synthetic spin-orbit coupling (SOC). By Raman dressing the m_f spin states within the $F=1$ manifold, we engineer atoms' energy-momentum dispersion to create synthetic SOC, and spin dependent synthetic electric and magnetic fields. We have used spin dependent synthetic electric fields to make two BECs with different spins oscillate and collide in the optical trap. We have studied the effects of SOC on both the momentum damping and thermalization behaviors of the BECs when undergoing such spin dipole oscillations. We have also used spatially dependent synthetic electric fields to excite the scissors mode, which has been used as a probe for superfluidity. We have investigated the effects of the synthetic gauge fields and SOC on the measured scissors mode

Chuan-Hsun Li
Purdue University

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