

Abstract Submitted
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Bose-Einstein condensates with spin and orbital angular momentum coupling¹ KUEI SUN, CHUNLEI QU, CHUANWEI ZHANG, The University of Texas at Dallas — Spin-orbit coupling (SOC) plays a crucial role in many branches of physics. In this context, the recent experimental realization of the coupling between spin and linear momentum of ultra-cold atoms opens a completely new avenue for exploring new spin-related superfluid physics. Here we propose that another important and fundamental SOC, the coupling between spin and orbital angular momentum (SOAM), can be implemented for ultra-cold atoms using higher order Laguerre-Gaussian laser beams to induce Raman coupling between two hyperfine spin states of atoms. We study the ground state phase diagrams of SOAM coupled Bose-Einstein condensates (BECs) on a ring trap and explore their applications in gravitational force detection. We further investigate two-dimensional disk-shaped BECs with focus on the interplay between SOAM coupling, interaction, and external trapping. Our results provide the basis for further investigation of intriguing superfluid physics induced by SOAM coupling.

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