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Spin-orbit coupled Bose-Einstein condensates BRANDON ANDERSON, TUDOR STANESCU, VICTOR GALITSKI, University of Maryland — We consider a Bose-Einstein condensate (BEC) of cold atoms with an internal pseudo-spin-1/2 degree of freedom that is coupled to momentum. The pseudo-spin degree of freedom emerges from the trapped multi-level atoms moving in the presence of spatially modulated laser fields. Within a so-called tripod scheme, the atom-laser interaction generates a pair of degenerate dark states. Upon adiabatically projecting onto the dark states subspace, an effective Hamiltonian emerges with a spin-orbit coupled pseudo-spin-1/2 degree of freedom. For a symmetric, Rashba-type spin orbit interaction the ground state of the pseudo-spin space is continuously degenerate along a circle in momentum space and may lead to many-body states with nontrivial topological properties. We investigate the Rashba-type spin-orbit BEC in the presence of weak density-density interactions.

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