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Mean Field Dynamics of Spin-Orbit Coupled Bose-Einstein Condensates YONGPING ZHANG, LI MAO, CHUANWEI ZHANG, Department of Physics and Astronomy, Washington State University, Pullman, WA — We derive the mean-field Gross-Pitaevskii equation for spin-orbit coupled Bose-Einstein conden-sates by taking account that the pseudospin states of atoms are superpositions of the hyperfine states with different scattering lengths. The ground state phases of the condensate in a harmonic trap are obtained numerically in various parameter regions. We find a new oscillation period in the center of mass motion of the condensate subject to a sudden shift of the harmonic trap. The oscillation period is dependent on the direction of the shift of the harmonic trap, linearly proportional to the spin-orbit coupling strength, and independent on the interaction strength.

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