Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Quench dynamics of a Bose gas under synthetic spin-orbit coupling TIAN-SHU DENG, University of Science and Technology of China, WEI ZHANG, Renmin University of China, WEI YI, GUANG-CAN GUO, University of Science and Technology of China, WEI YIS GROUP TEAM, WEI ZHANGS GROUP COLLABORATION — We study the quench dynamics of a Bose-Einstein condensate under a Raman-asssited synthetic spin-orbit coupling. To model the dynamical process, we adopt a self-consistent Bogoliubov approach, which is equivalent to applying the time-dependent Bogoliubov-de-Gennes equations. We investigate the dynamics of the condensate fraction as well as the momentum distribution of the Bose gas following a sudden change of system parameters. Typically, the system evolves into a steady state in the long-time limit, which features a stationary condensate fraction and an oscillating momentum distribution. The condensate fraction of the steady state depends on the quench parameter. We investigate how different quench parameters such as the inter- and intra-species interactions and the spin-orbit-coupling parameters affect the condensate fraction in the steady state. Furthermore, we find that the oscillatory momentum distribution in the long-time limit can be described by a generalized Gibbs ensemble with two branches of momentum-dependent Gibbs temperatures. Our study is relevant to the experimental investigation of dynamical processes in a spin-orbit coupled Bose-Einstein condensate.

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Date submitted: 28 Jan 2016 Electronic form version 1.4