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Quantum dynamics of spinor Bose gas in quasi-1D potentials
CHIH-YUAN HUANG, CHUN-CHIA CHEN, KENG-SHIAO WU, MING-SHIEN CHANG, Institute of Atomic and Molecular Sciences, Academia Sinica, Taipei 10617, Taiwan — Interacting quantum particles confined in a low-dimensional trap often can lead to strong correlation between the constituent particles due to the combined effects of restricted motional degrees of freedom and quantum fluctuations. In this work we present our studies on the quantum dynamics of a spinor Bose condensate in a 2D array of quasi-1D tubular potentials formed by a 2D optical lattice. Our experiment started with producing a ^{87}Rb spin-1 Bose-Einstein condensates (BEC) in a crossed optical dipole trap (XODT), and following that the condensate was further loaded into a 2D optical lattice superimposed on the XODT. In this configuration quantum phase transition between superfluid and insulator states was observed in the 2D lattice plane. When the XODT was suddenly switched off in the insulator state, the bose gas oscillated in the quasi-1D tubes, and analyses showed that the clouds were in either the Thomas-Fermi or Tonks-Girardeau regimes, depending on the density of the clouds. We will report our most recent results on spinor condensates in quasi-1D tubes and outline our future direction.

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