Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

First-order superfluid to Mott-insulator phase transitions in spinor condensates ZIHE CHEN, JIE JIANG, LICHAO ZHAO, Department of Physics, Oklahoma State University, Stillwater, OK 74078, SHENGTAO WANG, Department of Physics, University of Michigan, Ann Arbor, MI 48109, TAO TANG, Department of Physics, Oklahoma State University, Stillwater, OK 74078, LUMING DUAN, Department of Physics, University of Michigan, Ann Arbor, MI 48109, YINGMEI LIU, Department of Physics, Oklahoma State University, Stillwater, OK 74078 — We observe evidence of first-order superfluid to Mott-insulator quantum phase transitions in a lattice-confined antiferromagnetic spinor Bose-Einstein condensate. The observed signatures include hysteresis effect, significant heatings across the phase transitions, and evolutions of spin populations due to the formation of spin singlets in the Mott-insulator phase. The nature of the phase transitions is found to strongly depend on the ratio of the quadratic Zeeman energy to the spin-dependent interaction. Our observations are qualitatively understood by the mean field theory, and in addition suggest tuning the quadratic Zeeman energy is a new approach to realize superfluid to Mott-insulator phase transitions.

Zihe Chen
Department of Physics, Oklahoma State University, Stillwater, OK 74078

Date submitted: 25 Mar 2016 Electronic form version 1.4