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**Dynamics of superfluid to Mott-insulator phase transitions in spinor gases** ZACHARY SHAW, LICHAO ZHAO, ZIHE CHEN, JARED AUSTIN, YINGMEI LIU, Department of Physics, Oklahoma State University, Stillwater, Oklahoma 74078, USA — Spinor Bose-Einstein condensates possess a spin degree of freedom, leading to a range of phenomena absent in scalar condensates. One remarkable example is the existence of first-order superfluid (SF) to Mott-insulator (MI) quantum phase transitions in antiferromagnetic spin-1 spinor condensates. We experimentally study the dynamics of SF-MI phase transitions in antiferromagnetic spinor gases confined by cubic optical lattices. Our studies are performed in a quantum quench scenario beginning with spinor gases in the longitudinal polar superfluid state. In this scenario, the lattice potential is quenched to a very large value, which completely turns off the tunneling among adjacent lattice sites to ensure atoms enter into the MI phase. Spin population oscillations are observed after fast quenches and adiabatic quantum phase transitions are confirmed in sufficient slow lattice ramp sequences, while complicated spin dynamics appear at intermediate quench speeds. Our observations at the fast and slow quenches can be well explained by known theoretical models, however, a phenomenological model is introduced to describe the continuous quenches at intermediate speeds.

Zachary Shaw
Oklahoma State University-Stillwater

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