Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Adiabatic and Non-adiabatic quenches in a Spin-1 Bose Einstein Condensate MATTHEW BOGUSLAWSKI, BHARATH HEBBE MADHUSUDHANA, MARTIN ANQUEZ, BRYCE ROBBINS, MARYROSE BARRIOS, Georgia Inst of Tech, THAI HOANG, Purdue University, MICHAEL CHAPMAN, Georgia Inst of Tech — A quantum phase transition (QPT) is observed in a wide range of phenomena. We have studied the dynamics of a spin-1 ferromagnetic Bose-Einstein condensate for both adiabatic and non-adiabatic quenches through a QPT. At the quantum critical point (QCP), finite size effects lead to a non-zero gap, which makes an adiabatic quench possible through the QPT. We experimentally demonstrate such a quench, which is forbidden at the mean field level. For faster quenches through the QCP, the vanishing energy gap causes the reaction timescale of the system to diverge, preventing the system from adiabatically following the ground state. We measure the temporal evolution of the spin populations for different quench speeds and determine the exponents characterizing the scaling of the onset of excitations, which are in good agreement with the predictions of Kibble-Zurek mechanism [1].
[1] M. Anquez et al, arXiv:1512.06914

Bharath Hebbe Madhusudhana
Georgia Inst of Tech

Date submitted: 29 Jan 2016 Electronic form version 1.4