Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Numerical generation of solitons, vortex rings, and vortices in an ultracold Fermi gas PETER SCHERPELZ, KARMELA PADAVIC, ADAM RANCON, University of Chicago, ANDREAS GLATZ, IGOR ARANSON, Argonne National Laboratory, K. LEVIN, University of Chicago — Using the complex time-dependent Ginzburg Landau (TDGL) equation [1], we study quenches associated with phase imprinting, temperature sweeps and other density disturbances in three and two dimensional trapped Fermi gases. We consider variations in the TDGL equation due to the BCS-BEC crossover. While solitons are generally seen after the quenches, they are often accompanied by vortices and occasionally by vortex rings. Our work is partly motivated by the experimental observation of solitons in ultracold Fermi gases [2] which display both unusually slow oscillations and remarkable stability in a three-dimensional atomic gas. We discuss the stability and nature of the decay of these 3 types of collective superfluid inhomogeneities and their dependence on fluctuations, trap effects, and the trap aspect ratio. [1] A. Glatz, H. Roberts, I. Aranson, and K. Levin, PRB 84 180501 (2011). [2] T. Yefsah et al., Nature 499 426 (2013).

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Date submitted: 15 Nov 2013 Electronic form version 1.4