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Dissipative hydrodynamics in a quantum-fluid piston shock[1]
MAREN MOSSMAN, Washington State Univ, MARK HOEFER, University of Colorado, Boulder, P. G. KEVREKIDIS, University of Massachusetts, Amherst , PETER ENGELS, Washington State Univ — Dilute-gas Bose-Einstein condensates are effective systems for modelling and analyzing quantum hydrodynamic behavior. Recently, much emphasis has been placed on the study of quantum turbulence in these systems. We discuss theoretical, numerical and experimental results of a prototypical piston shock experiment in which a repulsive barrier is driven through a Bose-Einstein condensate. We show that under appropriate conditions the behavior is that of a dissipative rather than that of a dispersive system. Effective dissipation can be generated by the emergence of a turbulent bulge in the BEC. Experimental results are accompanied by detailed numerical simulations for the parameters of the experiment. Current status and future directions of the experiment will be discussed.

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