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Route to Quantum Turbulence in Trapped Bose-Einstein Condensates A. JOY ALLEN, NICK G. PARKER, NICK P. PROUKAKIS, CARLO F. BARENGHI, School of Mathematics and Statistics, Newcastle University — Turbulence in superfluid Helium has been the subject of many experimental and theoretical investigations (for review see e.g. L. Skrbek and K.R. Sreenivasan, Phys. of Fluids 24, 011301 (2012)) and recently, experimentalists have been able to visualize vortex lines, reconnection events and Kelvin waves (E. Fonda *et al.* arXiv:1210.5194). Weakly interacting Bose-Einstein condensates however, present a unique opportunity to resolve the structure of vortices and in turn study the dynamics of a vortex tangle (as has recently been created in an atomic cloud E.A.L. Henn *et al.* Phys. Rev. Lett 103, 04301 (2009)). We investigate ways of generating turbulence in atomic systems by numerically stirring the condensate using a Gaussian 'spoon' (analogous to a laser beam in the experiments), and study the isotropy of the resulting vortex tangle depending on whether the path the spoon stirs is circular or random. We model the system using the Gross-Pitaevskii Equation and extend our analysis to finite temperature using the Zaremba-Nikuni-Griffin (ZNG) formalism (E. Zaremba *et al.* Jour. Low Temp. Phys. 116, 277 (1999)), whereby the full dynamics of the noncondensate atoms are described by a semiclassical Boltzmann equation.

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