Quantum Turbulence in a harmonically trapped Bose-Einstein Condensate: from Vortices to Granulation

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Quantum Turbulence (QT) is a tangled configuration of vortices in a superfluid such as a Bose-Einstein Condensate (BEC). We present experimental studies of a harmonically trapped BEC undergoing oscillatory excitations that can nucleate vortices, and generate QT [1]. First we analyze the vortex nucleation mechanism through ripples formation on the superfluid surface due to a counterflow motion between thermal and condensed components[2]. Then, considering the system's finite size characteristic, the transition from a non-turbulent vortex regime to a turbulent state is explained in terms of two excitation parameters: amplitude and duration[3]. As these parameters are further increased, a granular state resembling the Bose glass phase is reached[4].

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