Turbulent BEC: Experimental Characterization and Universal Scaling Properties for Time/Space Evolution

V S Bagnato[1], A Garcia[1], M Moreno[1], G Telles[1], L Machado[1], L Madeira[1], G Roati[1], P Castilho[1], P Tavares[1], and A Cedrin[1]

[1] *Instituto de Física de São Carlos, Universidade de São Paulo, São Paulo, Brazil*
Contact Email: vander@ifsc.usp.br

One of the out-of-equilibrium states of great interest in superfluids is the state of turbulence. In this state, the proliferation of vortices or waves, creates one of several known states of turbulence. From equilibrium, with energy injection, there is evolution establishing a cascade of energy/particles that causes migration of energy to high moments, resulting in a dependence of power law type in the energy spectrum. The reason the system evolves this way has to do with its quest for equilibrium, reaching possibly a stationary state. If the energy injection is ceased, the system evolves in time. Observing the high moment component in the distribution allows us to verify its dependence by determining whether it is a non-thermal state. We detected in our experiment regions of excitation, where exponential (rather than Gaussian) dependence reveals the presence of non-thermalizing states. Such out-of-equilibrium states exhibit universal behavior when scaled in time and space. This universal behavior is of great interest, especially if associated with turbulent states. (Financial support from FAPESP, CNPq and CAPES)