

Hydrodynamic Energy Spectrum from Wave Turbulence

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Bose–Einstein condensates with their superfluidity property provide an interesting parallel to classical fluids. Due to the Kolmogorov spectrum of homogeneous turbulence the statistics of the incompressible velocity field is of great interest, but in superfluids obtaining quantities such as the statistics of the velocity field from the macroscopic wavefunction turns out to be a complicated task; therefore, most of the work up to now has been numerical in nature. We made use of the Weak Wave Turbulence (WWT) theory, which provides the statistics of the macroscopic wavefunction, to obtain the statistics of the velocity field, which allowed us to produce a semi analytical procedure for extracting the incompressible energy spectrum in the WWT regime. This is done by introducing an auxiliary wavefunction that preserves the relevant statistical and hydrodynamical properties of the condensate but with a homogeneous density thus allowing for a simpler description of the velocity field.