OPTICS WITH MATTER WAVES: DISORDER AND SPECKLE FIELDS

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Quantum turbulence is a modern topic with perspectives to promote improvement in the understanding of the overall phenomenon of turbulence. In this presentation, we report the results of the quantum turbulence in Bose-Einstein condensate. In special the disorder created by the turbulence, induce in the matter wave a speckle characteristic. The speckle field of regular coherent light and coherent matter wave are analyzed in parallel. We found remarkably similar statistical properties underlying the spatial propagation of both phenomena. The calculated second-order correlation together with the typical correlation length of each system is used to compare and substantiate our observations. We believe that the close analogy existing in between an expanding turbulent quantum gas and a traveling optical speckle might soon become an exciting new research branch for investigating the disordered quantum matter. During the presentation, exciting possibilities with quantum systems out of equilibrium will be discussed.
(Supported by FAPESP and CNPq)