QUENTIN GLORIEUX

LKB - Laboratoire Kastler Brossel
Sorbonne Université

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15:30

Amphi Jules Haag
SupMicrotech ENSMM

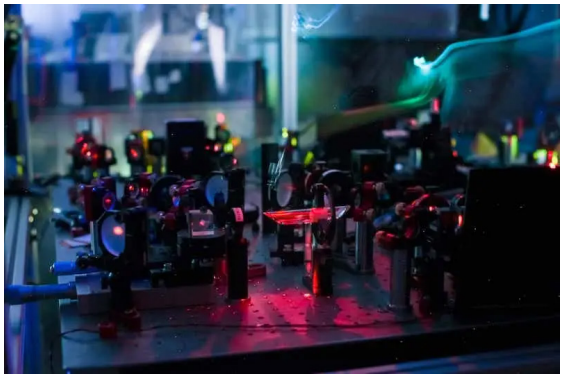
femto-st SCIENCES & TECHNOLOGIES

LES RENDEZ-VOUS QUANTIQUES

Quantum fluids of light in hot atomic vapor

Over the past decade, the paraxial propagation of coherent laser beams in nonlinear optical media has emerged as a powerful platform for exploring analogies between nonlinear optics, many-body physics and cold atomic gases. In this lecture, we will introduce the concept of a paraxial fluid of light, in which the transverse dynamics of a laser beam propagating in a nonlinear medium maps onto the evolution of a 2D quantum fluid governed by a nonlinear Schrödinger equation (NLSE), with the propagation axis playing the role of time.

We will discuss the mathematical basis of this analogy, pointing out the correspondence between optical parameters (refractive index, Kerr nonlinearity, diffraction) and atomic quantum gases quantities. From this, we will explore several important phenomena of quantum fluids, such as superfluidity, solitons, vortex dynamics, and dispersive shock waves.
We will present recent experimental results about dynamics of topological excitations in a superfluid and non equilibrium dynamics after crossing a quantum phase transition (normal to superfluid or miscible to immiscible).
Overall, the goal of this talk is to bridge the gap between a purely optics description and the ultracold atomic quantum gases formalism.



PLUS D'INFOS !