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Light superfluidity in hot atomic vapors

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A laser field propagating through a hot atomic vapor leads to a third-order nonlinear Kerr susceptibilty. In the paraxial approximation the evolution of the transverse electric field is described by a 2D Gross-Pitaevskii equation. As such, this system is a promising platform to study phenomena related to Bose-Einstein condensation and superfluidity of light.

In this talk, I will report on the measurement of the dispersion relation of small amplitude density waves propagating on top of a photon fluid. We find a dispersion relation of Bogoliubov type: linear at small wave vector as expected in the superfluid regime and "particle-like" (quadratic) at larger wave vectors 1. In the superfluid regime, we characterize the dependence of the sound velocity with intensity (photon density) and compare our results with theoretical predictions.

1 Observation of the Bogoliubov Dispersion in a Fluid of Light, Q. Fontaine, T. Bienaimé, S. Pigeon, E. Giacobino, A. Bramati, and Q. Glorieux, Phys. Rev. Lett. 121, 183604 (2018).

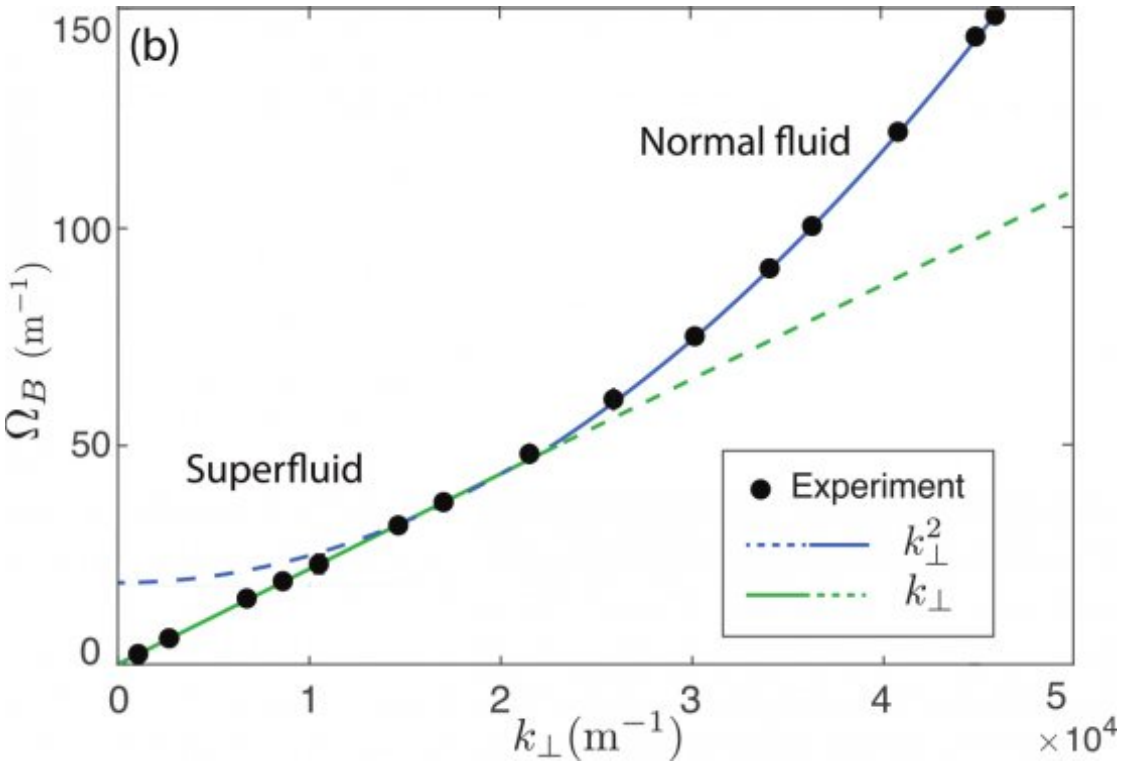

Figure 1: Dispersion relation of small amplitude density waves propagating on top of a photon fluid

Choix de session parallèle

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