Hydrodynamics of light-matter fluids

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Résumé

Polaritons, half-light half-matter mixed states arising from the strong coupling between excitons and photons in semiconductor microcavities, are composite bi-dimensional interacting bosons. They can manifest macroscopic quantum coherence effects at high temperatures (5-300 K) due to their very low mass. In particular, polaritons behave like a quantum fluid with specific properties coming from its intrinsic out of equilibrium nature, determined by the short polariton lifetime (some picoseconds)
In this talk, I will briefly review the superfluid and Cerenkov regimes [1, 2] in these systems, then I will discuss the formation of quantized vortex and dark solitons in a polariton quantum fluid interacting with a large obstacle [3, 4]. Finally, I will present the recent observation of dark half-solitons in a spinor polariton fluid [5].

In the last part of the talk, the possibility to generate vortex-antivortex lattices in a confined geometry will be discussed.

These results demonstrate that the polaritons are an ideal system for the study of the quantum fluid properties.

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