

Vortices and superfluidity in Exciton-Polariton condensates

Wpisany przez Jacek Szczytko

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Polaritons are amazing quasiparticles originating from the coupling of photons with excitons (electron-hole pairs in semiconductors). Polariton condensates may be created both spontaneously through a “*standard*” phase transition towards a Bose Einstein condensate, or be resonantly driven with a well-defined initial phase, speed and spatial distribution.

Thanks to the photonic component of polaritons, the properties of the quantum fluid may be accessed very directly, with in particular the possibility of detailed interferometric studies. This allows for example to probe the long-range coherence properties of a quantum fluid with unprecedented ease. This also allows testing superfluid properties with great precision in space and time.

Here, I will describe the static and dynamics of vortices in polariton condensates, obtained with a picosecond time resolution, in different configurations, with in particular their phase configuration. I will show in particular the dynamics of spontaneous creation of a vortex as well as the dissociation of a full vortex into two half vortices.

I will also highlight some of the recent results obtained through the shaping of the system, either using nanotechnology processes, or using all optical means, or both of them. This allows in particular the study superfluid hydrodynamics of polariton fluids.

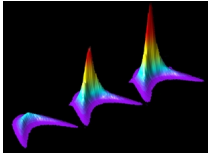
This work has been performed at EPFL by a dream team of Postdocs, PhD students and collaborators: K. Lagoudakis, G. Nardin, T. Paraiso, G. Grosso, F. Manni, Y Léger, S. Trebaol, M. Portella Oberli, F. Morier-Genoud and the help of our theorists friends V, Savona, M.

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Wouters and T. Liew. The CdTe sample that we have been using has been prepared by Régis André at the University of Grenoble, and we strongly benefited from the long time collaboration with the group of Le Si Dang.



Changes, though the condensation threshold of the polariton distribution observed in k space

Szkoła odbywa się dzięki wsparciu projektu POKL UDA – POKL.04.01.01-00-100/10 "Chemia, fizyka i biologia na potrzeby społeczeństwa XXI wieku: nowe makrokierunki studiów I, II i III stopnia" prowadzonemu na Wydziale Chemii UW.