Post Doc position in Physics

Photon condensation and coherence in semiconductor media (24 months)

Research unit: INPHYNI laboratory / Mixed research unit Université Côte d'Azur, National Centre for Scientific Research (CNRS)

Project summary:

The emergence of coherent light is among the most fascinating examples of cooperative phenomena, and it is also the key to the many application of lasers where it is attributed to an out of equilibrium compensation between gain and losses.
In recent years though, coherent light emission has also been observed as a result of the quantum statistics phenomenon of Bose Eistein condensation of photons in a dye solution [Klaers2010]. While very puzzling at first sight ("photons have no mass and no chemical potential"), a thermodynamical treatment of luminescence in fact suggests that photons enclosed in a resonator filled with a semiconductor medium do possess an effective mass and chemical potential [Wurfel1982] (even if condensation was not envisioned at the time). Following the seminal experiment, Bose Einstein condensation of photons has been observed in a few other experimental systems and the theoretical treatment of the phenomenon is now making progress [Nyman2018,Weill2019,Keeling2016]. At Institut de Physique de Nice, the collaboration of cold atom experts and laser physicists has led to the first experimental observation of thermalization of light in contact with a thermal bath of free electrons and holes, eventually leading to a phase transition compatible with Bose-Einstein condensation [Barland2021].

We are looking forward to hosting a highly motivated and talented postdoctoral researcher willing to pursue an autonomous experimental research on Bose-Einstein condensation of photons in semiconductor media. The successful applicant will design and work on cutting-edge yet manageable experiments within an interdisciplinary scientific team and have the opportunity to become the European leading researcher on this emerging topic the interface between quantum gases and semiconductor devices. The interaction with researchers studying the transition to coherence in nano- and microlasers will further enrich the topic, lending additional depth to the expertise acquired on site.

Candidate profile:

The ideal candidate will have a PhD in physics or a related field, with a strong background in nonlinear optics, cold atoms or laser physics. Experience with experimental atomic physics or photonics is highly desirable. Curiosity, creativity and capacity to work autonomously will be key to success, and excellent verbal and written communication skills are required.

Hosting team:

Stephane BARLAND, Université Côte d'Azur: Stephane.Barland@univ-cotedazur.fr
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References:

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