

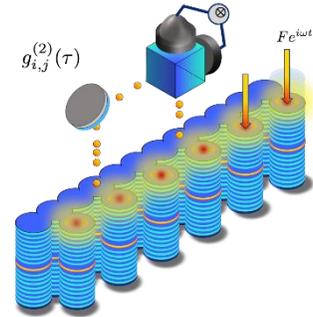


Postdoc position on “Quantum optics in synthetic photonic materials”

A postdoc position (24 months with possibility of extension) has opened to carry out experimental research on Quantum Fluids of Light at the Center for Nanoscience and Nanotechnology (C2N, Université Paris-Saclay, France), in the context of the ERC starting grant project ARQADIA: “Artificial quantum materials with photons: many-body physics and topology” led by Sylvain Ravets. The general objective of the project is to study out-of-equilibrium strongly correlated phases of light in nanofabricated photonic quantum materials. The research will be conducted in the “polariton quantum fluids” team at C2N (<http://www.polaritonquantumfluid.fr>), in tight collaboration with Sylvain Ravets and Jacqueline Bloch.

Quantum fluids of light emerge in semiconductor microcavities, where both light and electronic excitations (excitons) can be confined to very small volumes. The resulting strong light-matter coupling gives rise to hybrid light-matter quasi-particles named cavity polaritons. Polaritons propagate like photons but interact with their environment via their matter part. Contrary to conservative systems, like cold atoms, cavity polaritons are intrinsically dissipative and can thus be used to naturally implement quantum simulations of driven-dissipative systems. Furthermore, multi-photon entanglement can be imprinted directly on photons leaking out of the system, thus realizing new sources of quantum light.

At the core of the present project are state of the art lattices of coupled resonators, which will be realized in the C2N clean room, fully equipped for nano-technological processing. Such lattices enable on demand tailoring of the polariton dispersion in order to control the polariton dynamics. One important challenge will be to induce photon-photon interactions that are strong enough to generate quantum correlations between polaritons. Several ideas will be explored to obtain new cavity structures with improved optical properties, and featuring active materials with optimized polariton interactions. The physical properties of these synthetic materials will be probed by advanced optical and quantum optical spectroscopy at cryogenic temperature. The quantum nature of the generated states will be revealed by measuring spatio-temporal correlations between photons escaping polariton lattices. This will be realized for different dimensionalities (1D, 2D), and various geometries of the lattice, in particular those featuring topologically non-trivial band structures obtained by breaking time-reversal symmetry under intense externally applied magnetic fields. The platform will offer a unique opportunity to study the interplay between nonlinearities and topology in open systems.



The recruited postdoc will be involved in the design and fabrication of the cavity samples, the experimental study of the out of equilibrium dynamics, as well as theoretical modelling via simulations. He/she will actively participate in weekly research group meetings and will be involved in the co-supervision of PhD students working on other projects related to topology or nonlinear optics. The candidate should be a highly motivated researcher with independent and creative thinking. Strong skills in experimental physics are required, together with solid knowledge in photonics, solid state and quantum physics. Candidates should have a significant publication track record, and a recently obtained PhD diploma.

Candidates are requested to send the following documents to S. Ravets (sylvain.ravets@c2n.upsaclay.fr) and/or J. Bloch (jacqueline.bloch@c2n.upsaclay.fr):

- Detailed CV (pdf)
- Motivation letter (pdf)
- Candidates are kindly requested to ask to two reference researchers to send recommendations letters.