
SEMINAR: Photon correlations from exciton-polariton microcavities

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12:30 to 13:30

Seminar Room

Exciton-polaritons (EP) are hybrid light-matter quasiparticles that are produced in semiconductor microcavities, when resonantly pumped by a laser. They may be viewed as driven-dissipative analogues of quantum gases, where EP play the role of atoms, interacting via their matter component (excitons, which are bound electron-hole pairs in the semiconductor), and being probed through their photonic component. States of matter which are analogous to Bose-Einstein condensates may form inside of the microcavity, and photons escaping from it are measured. However, in contrast to trapped cold atom systems, the fact that the system is hosted in a crystalline solid-state lattice makes it fundamentally coupled to thermal noise. Due to the interactions (non-linearities) inside the EP system, outgoing light shows non-trivial photon correlations, and possibly quantum entanglement. This is somewhat reminiscent of the phenomenon of spontaneous parametric down conversion studied in quantum optics, but shows also important differences which are the topic of current investigation. I will present a joint theory-experiment effort to understand the nature of photon correlations produced in such EP systems.

References : <https://arxiv.org/abs/2304.08677> [Frerot et al, PRX 2023] ;
<https://arxiv.org/abs/2501.07899> [Richard et al, 2025].

Hosted by: Prof. Dr. Maciej Lewenstein