

Seminar

Ballistic Expansion of Exciton Wave Packets in Noisy Multimode Cavities

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Advances in optical measurements enable precise tracking of cavity polariton dynamics with high spatiotemporal resolution. In this talk, I present a theoretical study of wave-packet dynamics in a noisy emitter lattice embedded in a multimode microcavity. In the absence of noise, the emitter probability density splits into two Gaussian wave packets governed by lower and upper polariton branches. In contrast, noise induces dephasing, leading to multiple dynamical regimes, including Rabi oscillations, decay of center-of-mass motion, thermalisation, and a crossover from ballistic to diffusive spreading. Notably, dephasing can enhance ballistic transport beyond the microscopic dephasing time. These findings provide insights into controlling transport in polaritonic systems and are relevant for emerging quantum technologies.

References:

- (1). Characterisation of Polariton Dynamics in a Multimode Cavity: Noise-enhanced Ballistic Expansion, <https://arxiv.org/pdf/2410.11051>,
- (2). Characterisation of Polariton Dynamics in a Multimode Cavity (II): Coherent-Incoherent Transition Driven by Photon Loss, <https://arxiv.org/pdf/2507.19671>

Wednesday, Apr 15th 2026

14:30 Hrs (Tea / Coffee 14:15 Hrs)

Seminar Hall, TIFRH