

Plenary Talk

PV II Mon 10:30 RW 1

Universal scaling laws in the coherence decay of polariton Bose Einstein condensates — ●JACQUELINE BLOCH — Center for Nanoscience and Nanotechnology, Paris-Saclay University/CNRS, 10 bd Thomas Gobert, 91120 Palaiseau, France

Cavity polaritons, hybrid light-matter quasiparticles emerging from the strong coupling between photons confined in cavities and excitonic excitations [1] provide a powerful platform to explore the *physics of Bose Einstein condensation in a driven dissipative context*. In 2015, it was discovered that under certain excitation conditions, the phase dynamics of a polariton condensates is governed by the celebrated Kardar Parisi Zhang (KPZ) equation [2-6]. This means that the spatio-temporal coherence decay should reveal universal KPZ scaling laws. The full phase diagram of these out of equilibrium condensates was then explored theoretically both in 1D [7] and 2D [8] and the very existence of a KPZ phase in 2D is a highly debated topic.

In the present talk, after a general introduction about polariton condensates, I will review experimental investigations of their coherence properties. I will describe our experimental demonstration of KPZ

universal behavior in 1D [9] and then discuss our recent interferometry experiments realized in 2D. Depending on the strength of the non-linearity in the system (that can be varied changing the detuning between the exciton resonance and the cavity mode), different scaling laws in the spatio-temporal decay of the coherence are revealed. Our results hints toward a cross over between a diffusive Edward Wilkinson regime and a superdiffusive KPZ regime.

This work highlights the profound difference between driven-dissipative out of equilibrium condensates and their equilibrium counterparts.

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