

Emergent pumping in a non-hermitian system

Thursday 6 July 2023 08:55 (25 minutes)

The time evolution of a quantum system can be strongly affected by dissipation. Although this mainly implies that the system relaxes to a steady state, in some cases it can bring to the appearance of new phases and trigger emergent dynamics. In our experiment, we study a Bose-Einstein Condensate dispersively coupled to a high finesse resonator. The cavity is pumped via the atoms, such that the sum of the coupling beam(s) and the intracavity standing wave gives an optical lattice potential. When the dissipation and the coherent timescales are comparable, we find a regime of persistent oscillations where the cavity field does not reach a steady state. In this regime the atoms experience an optical lattice that periodically deforms itself, even without providing an external time dependent drive. Eventually, the dynamic lattice triggers a pumping mechanism. We will show complementary measurements of the light field and of the atomic transport, proving the connection between the emergent non-stationarity and the pump.

Authors: Mr BAUMGÄRTNER, Alexander (ETH Zurich); Dr DREON, Davide (ETH Zurich); HERTLEIN, Simon (ETH Zurich); Prof. ESSLINGER, Tilman (ETH Zurich); Dr DONNER, Tobias (ETH Zurich); Dr LI, Xiangliang (ETH Zurich)

Presenter: HERTLEIN, Simon (ETH Zurich)

Session Classification: Quantum Sensors II