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Scattering from the dark and adversarial modes: new self-organisation phases DAVIDE DREON, ANDREA MORALES, PHILIP ZUPANCIC, XIANGLIANG LI, ALEXANDER BAUMGRTNER, TILMAN ESSLINGER, TOBIAS DONNER, ETH Zrich — A Bose-Einstein Condensate (BEC) inside an optical resonator can undergo a phase transition to a self-organised state when illuminated with a red-detuned pump beam. In our recent experiment, we study the interaction of the BEC with two non-degenerate polarisation modes of a cavity. I will show how the couplings to the two modes, which are independently tuned via the scalar and the vectorial part of the atomic polarisability, give rise to competing self-organisation phases. In a second experiment, we explore the blue side of the atomic resonance. We observe that self-organisation is still possible despite the atoms being expelled from the light fields, suppressing photon scattering. Moreover, the repulsive lattices induce non-trivial modifications of the band structure and the dispersive shift triggers dynamics of the order parameter, both effects leading to richer phase diagrams.

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