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Interplay of Coherent and Dissipative Dynamics in Condensates of Light[1] MILAN RADONJIC, Technical University of Kaiserslautern, Germany, WASSILIJ KOPYLOV, Technical University of Berlin, Germany, ANTUN BALAZ, Institute of Physics Belgrade, Serbia, AXEL PELSTER, Technical University of Kaiserslautern, Germany — Based on the Lindblad master equation approach we obtain a detailed microscopic model of photons in a dye-filled cavity, which features condensation of light. To this end we generalise a recent non-equilibrium approach of Kirton and Keeling such that the dye-mediated contribution to the photon-photon interaction in the light condensate is accessible due to an interplay of coherent and dissipative dynamics. We describe the steady-state properties of the system by analysing the resulting equations of motion of both photonic and matter degrees of freedom. In particular, we discuss the existence of two limiting cases for steady states: photon Bose-Einstein condensate and laser-like. In the former case, we determine the corresponding dimensionless photon- photon interaction strength by relying on realistic experimental data and find a good agreement with previous theoretical estimates. Furthermore, we investigate how the dimensionless interaction strength depends on the respective system parameters.

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